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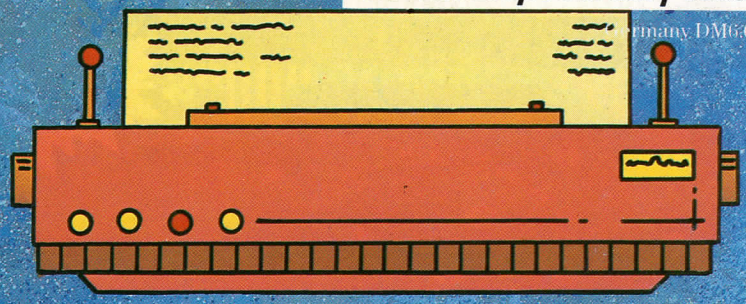
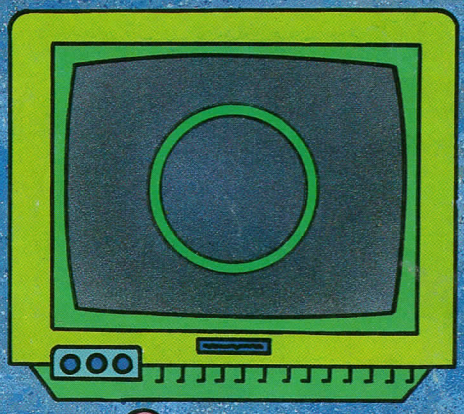
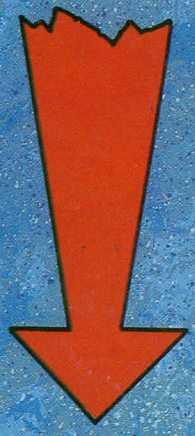
SINCLAIR'S SUPERMICRO

QL USER







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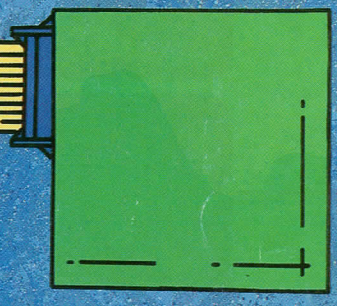
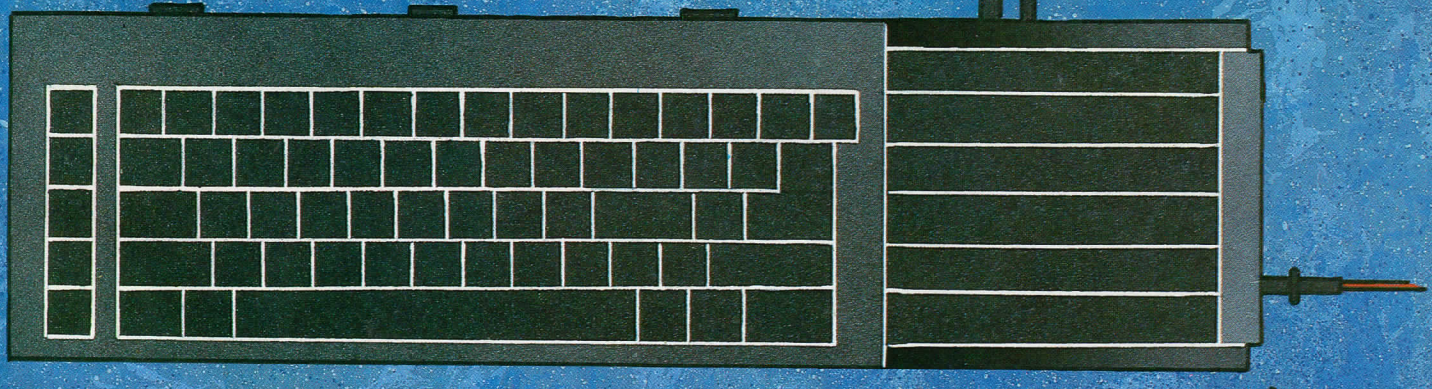
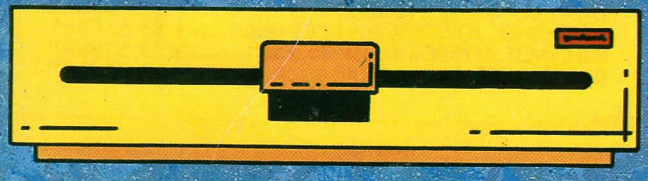


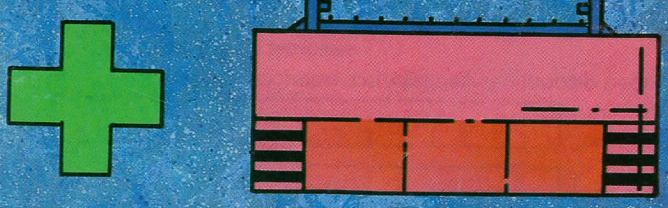
QL PERIPHERALS

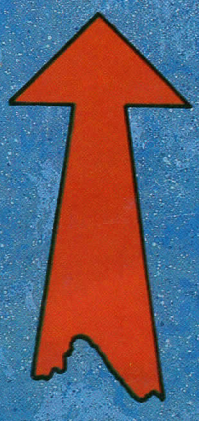
MICRO-ASTROLOGY

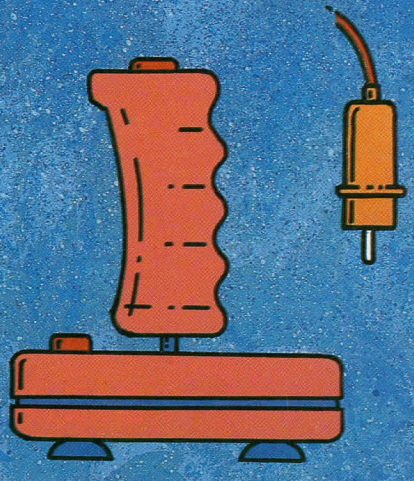




MICRODRIVE OPERATION







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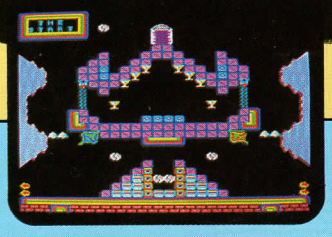
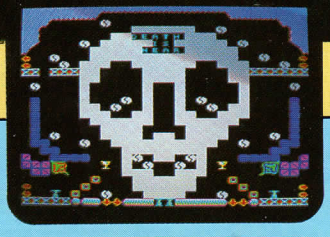
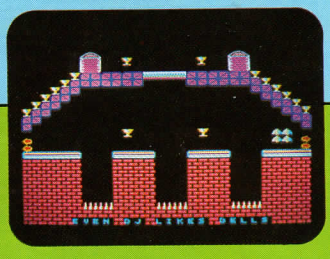
QL Caverns is a trade mark of Sinclair Research Ltd.







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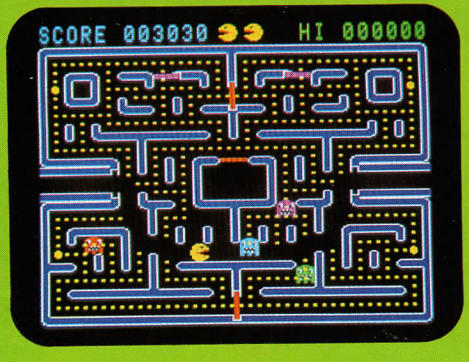

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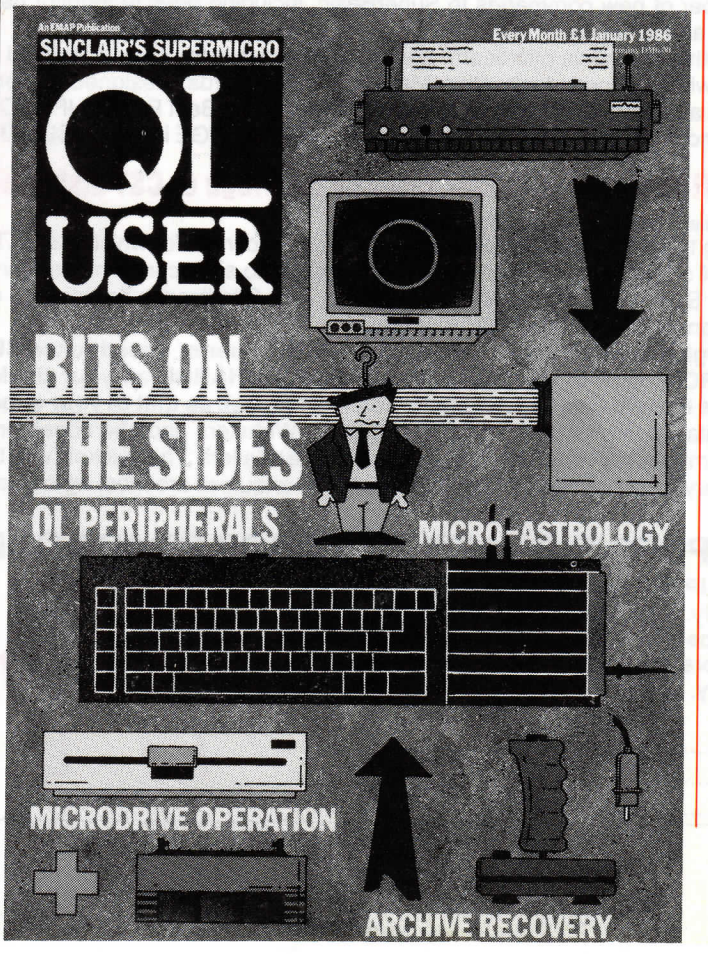

NEXT MONTH

Driving At Random
The complete RAM disk driver package to type in and run.

QL Assisted Design
Computer design packages — best buys on the QL.

Of Disks And Drives II
The intricacies of floppy disk operation explained.

Bits On The Sides II
The next instalment of our round-up of QL peripherals.

QL User
FEBRUARY '86
ON SALE
January 21st 1986

CONTENTS SUBJECT TO LATE REVISION

SUPERCHARGE
SUPERBASIC COMPILER

NEW!

★ This amazing compiler translates QL SuperBasic into 68008 machine code, completely automically! It supports the entire syntax of SuperBasic (except, obviously, commands like EDIT/LIST/RENUM which are specific to Basic and would be meaningless in machine code). That means all file handling, multidimensional arrays, procedures (with parameters too), local variables, strings, sound, graphics, separate superspeed integer, floating point arithmetic (displaying Nine Digits of Precision versus The Interpreter's Seven!), extensions to Basic, the complete range of SuperBasic control constructs . . . refer to your QL User Guide for the whole list!

★ The code generated by Supercharge runs incredibly fast – here are the standard PCW benchmarks (PCW June 1984) for QL Basic compared with the timings for the same programs when Supercharged:

BENCHMARK NUMBER	1	2	3	4	5	6	7	8
SUPERBASIC (SECS)	2.1	6.4	10.7	10.3	13.2	26.1	61.8	25.8
SUPERCHARGE (Floating Point) (SECS)	**0.2**	**0.3**	**1.2**	**0.9**	**1.0**	**2.5**	**4.1**	**8.6**
SUPERCHARGE (Integer) (SECS)	**0.06**	**0.1**	**0.3**	**0.3**	**0.3**	**0.7**	**1.0**	**N/A**

(Variations will exist between different QL systems)

Hence on standard benchmarks a 60× speed increase is possible . . . SUPERCHARGE, however, is at its least impressive when compiling such short programs, as SuperBasic grows slower as program size increases. Speed improvements of **SEVERAL HUNDRED TIMES** are in no way uncommon when using SUPERCHARGE on programs of average size.

★ SUPERCHARGED programs are independent jobs (so you don't need to have SUPERCHARGE loaded to run them).

★ SUPERCHARGED programs are relocatable and are inherently multitasking (so you can run any number of them at once).

★ SUPERCHARGE optimises as it compiles – and the advanced user may switch the optimisation from time to space on a line by line basis.

★ SUPERCHARGED programs load far more quickly (at least 5-10 times) and, hence reliably, than normal SuperBasic – there is no pause between blocks

★ SUPERCHARGE can compile programs of ANY size, provided you have enough RAM on board (for the unexpanded QL, the limiting source code size is still a massive 40K!). Compilation listings can be directed to any device – and a complete set of compile/run time error messages (clear and unambiguous, unlike the Interpreter's!) are issued, showing exact error positions.

★ Add-on commands, functions and procedures are allowed by SUPERCHARGE, provided they do not read/alter Interpreter data structures . . . Hence utilities supplied with disk systems and QL Toolkits will work with SUPERCHARGE!

★ SUPERCHARGE is compatible with all disk and memory-expansion systems. The system we recommend (on grounds of quality, speed and reliability) is the one we used in developing SUPERCHARGE – the CST disk system, available from Computamate (Scotia Road, Burslem, Stoke-on-Trent – Tel: 0782 811711) or from us – write in for details.

★ SUPERCHARGED programs are protected against unauthorised modification/listing/tampering – permanently.

★ SUPERCHARGE is the only QL Compiler which offers the user the convenience of interactive testing, editing and debugging.

★ SUPERCHARGE cures most bugs and lifts many of the restrictions imposed by the Interpreter! Examples of problems completely cured under SUPERCHARGE: "Too many parameters in a procedure" bug; the RESPR bug, GOSUB in a single-line FOR statement, CALL in long programs, procedure parameters/integer/string variables used in SELECT statements, full integer arithmetic, etc, etc.

★ SUPERCHARGE adds a number of new commands to SuperBasic, including ones to monitor device statuses, to list/stop/remove tasks, to change task priorities, and so on.

★ SUPERCHARGE is supplied either on disk or microcartridge and can be easily transferred/backed up from one to the other.

★ SUPERCHARGE is supplied with a superb Instruction Manual (40,000 words) designed to complement the User Guide – it is designed for both beginner and advanced user, with sections on "Getting The Best From SUPERCHARGE" and many examples.

★ SUPERCHARGE itself loads and runs phenomenally fast – yes, SUPERCHARGE is itself a SUPERCHARGED program!

£59.95 COMPLETE WITH DETAILED MANUAL (specify cartridge or CST diskette)

AVAILABLE NOW!

Author: Simon Goodwin. Assistant: Gerry Jackson. Mission Control: Freddy Vachha.

NOTE: Software houses requiring to use SUPERCHARGE will need a site licence, for which the VAT-inclusive cost is £250 (in addition to the price of one compiler). Instructions are supplied to site licence holders on the making of appropriate numbers of copies of SUPERCHARGE for their exclusive use. Site licence holders are exempted from paying Digital Precision royalties on SUPERCHARGED programs.

Why use C or Pascal when a highly structured, full-featured Basic of superior speed (once SUPERCHARGED) and flexibility is already on your QL? SUPERCHARGE is the final solution. SUPERCHARGE all your Basic programs (past, present and future) – including any you have bought – and realise your potential as well as that of your superb computer.

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DIGITAL PRECISION

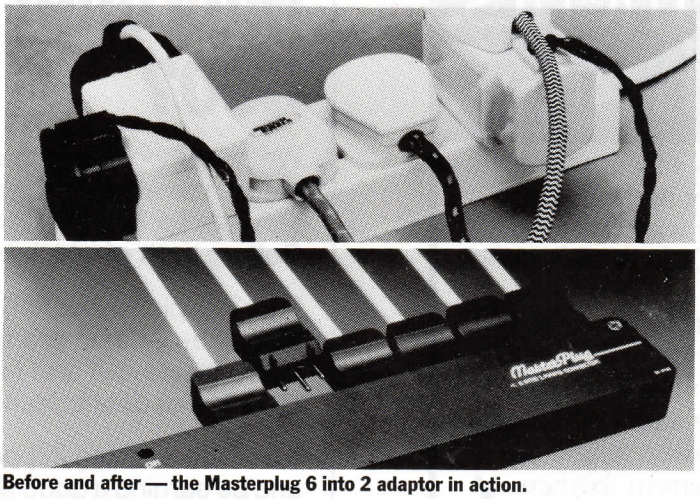
QL SCENE

More On Memory

Following our recent comments concerning internal memory upgrades (November 1985 issue), Silicon Express have confirmed that in tests their external upgrade has proved to be some 25% quicker at performing a recalculation on an Abacus program when compared to internal upgrade.

On the subject of internal memory expansion the company stress that success of any such upgrade is dependent on having the correct component removal equipment. Without the correct tools and test equipment it would be all too easy to cause considerable damage to the QL while attempting component removal. The warranty on Silicon Express's own internal upgrade is for a 90 day period and has been extended to cover the microdrives.

Having expanded the QL's memory many users will be on the look out for a RAM disk driver. In their opinion however, the majority of disk drivers are far from easy to operate. Silicon Express are thus prepared to offer a free disk system to anyone who can produce a RAM disk utility that will run with the Psion packages.



Before and after — the Masterplug 6 into 2 adaptor in action.

Plug It In

Take a QL, monitor, disk drive, printer and modem and one 13 amp power point and you are faced with a problem — five into one won't go. Traditionally the solution has been to buy a four in line distribution block and to supplement this with extra two way adaptors as necessary. This is hardly an ideal solution to the problem though. Not only does the jumble of power leads and plugs look unsightly but quite often it can be unsafe.

Conblock Electrical have come up with a solution in the form of MasterPlug, a six in-line adaptor that is 30% smaller than the familiar four way adaptor. The adaptor is supplied complete with six special plugs, each having a six amp capacity.

The company can also supply a four way adaptor that may be plugged into any 13 amp outlet.

Both adaptors should be widely available from High Street electrical stores.

QL Comms

It would seem that not too many QL users make use of their computer to access Prestel. The latest figures for Micronet subscriptions indicate that QL registrations are way down the list in the 'also rans' slot. Figures for QL registrations may not give the full story though. Micronet believe that many more QL owners use their service than the figures indicate. The reason they believe that is, in addition to their QL, many people will have a second machine, most likely the Spectrum, as the equipment necessary to access Micronet via the Spectrum is far cheaper than equivalent QL models.

Keep It Clean

It's a well established fact that the majority of disk read/write errors can be attributed to small particles of dirt that find their way onto the disk drive's recording head. Even a spec of dust no bigger than 30 millionths of an inch can spell disaster for a disk drive. While 3½" drives are far less prone to the effects of dust than 5¼" units, it is still advisable to clean the heads on a regular basis. To meet the cleaning requirements of 3½" disk owners DNCS produce a product that goes under the name of a 'disposable, wet/dry, non-abrasive diskette drive head cleaning system'. The cleaning kit costs £17 and can be used for ten cleaning sessions — that's £1.70 a throw. While this may seem expensive, when the cost of the harm that could be done by a dirty disk head is considered, it is quite reasonable.

For more information contact DNCS on 0706 67567.

ABSTRACTS

The name Medic will be familiar to many readers of *QL User*. Over the past months the company has used the pages of this magazine to advertise offers on QL disk systems that seemed too good to be true — in the final analysis it could turn out that this is exactly what they were. At the time of writing we are sorry to report that the company does not seem to be in a position to supply goods ordered by customers and advise readers not to send Medic any money. Any readers who ordered goods from the company and whose money was banked by Medic are asked to write to our offices with full details of all transactions with them. Where possible these should include the date on which any goods were ordered, the quantity and price of the items and, in the case of cheques, the date on which these were cashed by Medic. Until we have collected together details of all readers who may be affected by the problems at Medic we are unable to say what the final outcome of the affair is likely to be.

The laws of libel prevent us from saying too much about the Medic case at present. It will take some time to assess just what went wrong with the company.

The Medic saga provides an excuse, if one were needed, to pass on some general comments on ordering high value goods from mail order companies. We must stress at this stage that *QL User* takes every possible step to ensure the bona fides of those companies advertising in the magazine, readers can however take a few sensible steps of their own. For those who have a major credit card the advice is to use it on any purchase over £100. The reason behind this advice is that recent consumer legislation means that using your credit card for such purchases means that a contract exists not only between you and the vendor of the goods but also between you and the credit card company. If the goods fail to arrive for any reason and the company from which you ordered them from goes bust, you will have a claim in law against the credit card company.

For those who do not have a credit card, the most sensible option seems to be to make use of the Post Office's COD service. The only drawback with this scheme is that if you wish to pay by cheque, you will have to wait for this to be cleared by the PO, this can take quite a few days.

A third option is to, by arrangement with the company concerned, to pick the goods up in person — this though defeats the idea of mail order.

Once again while we would wish to stress that readers will very rarely suffer as a result of the failure of advertisers in *QL User* to supply goods, we would urge anyone considering the purchase of any high value items of equipment to take steps to safeguard their money.

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If you're interested just write to me, Mike Brown, enclosing details of your qualifications and interests (and telling me what a great programmers you are!) to arrive not later than **Friday 16th January 1986.**

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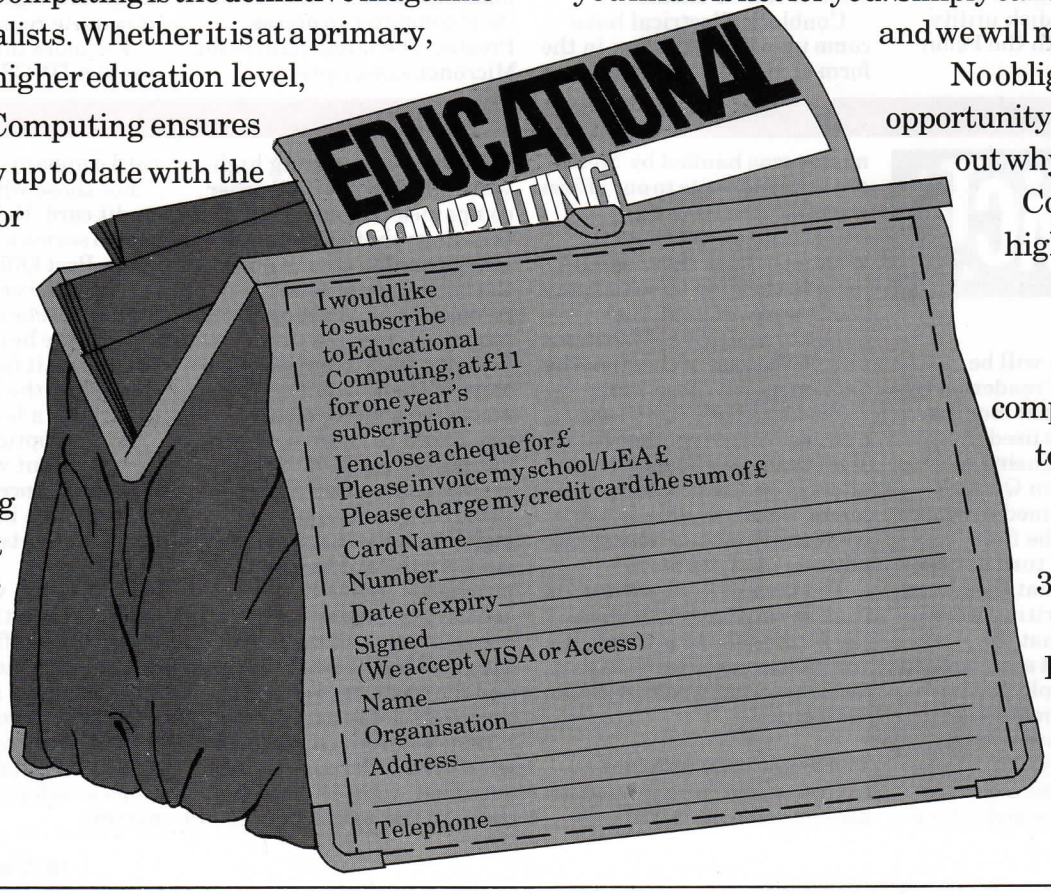

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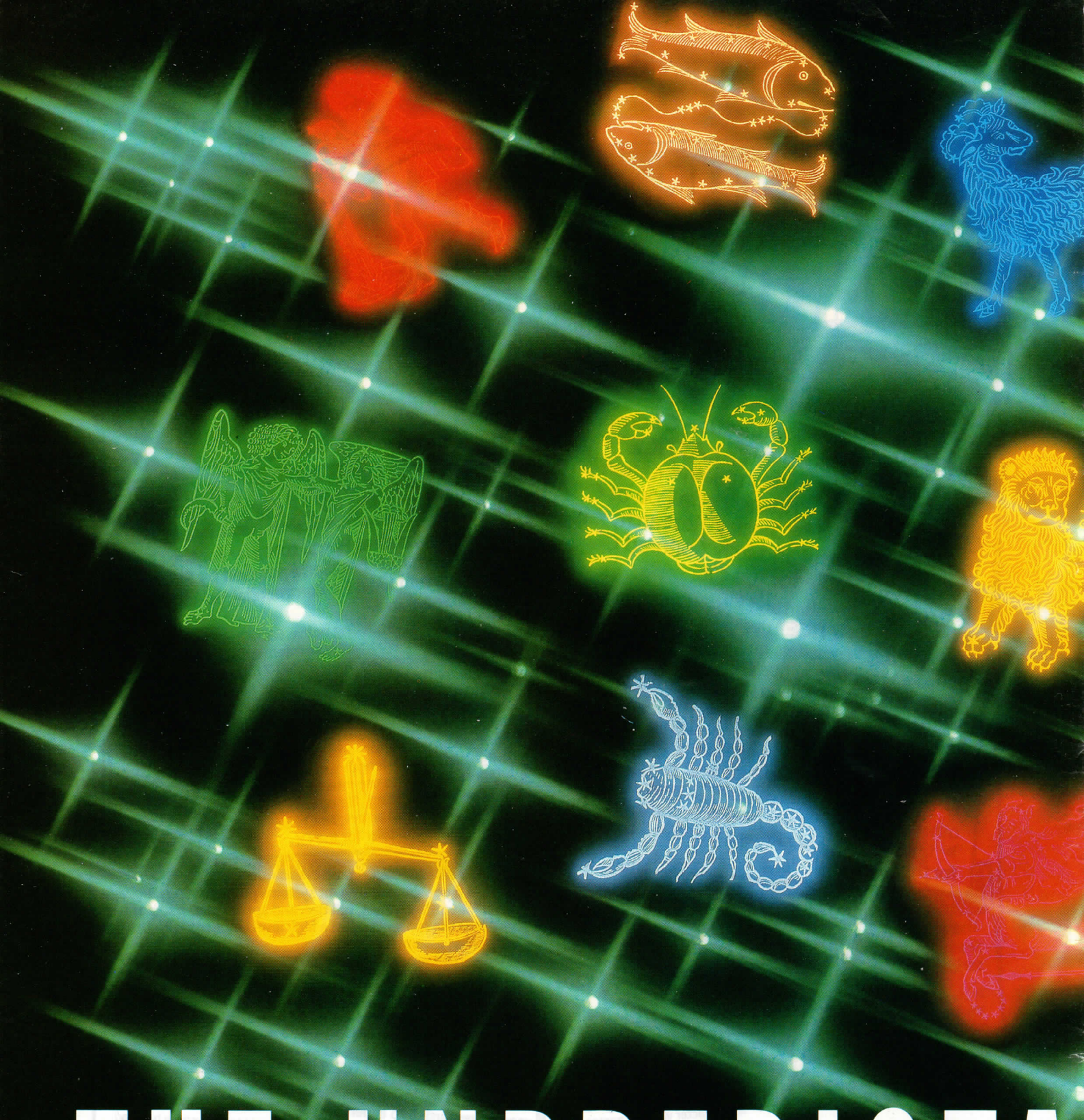


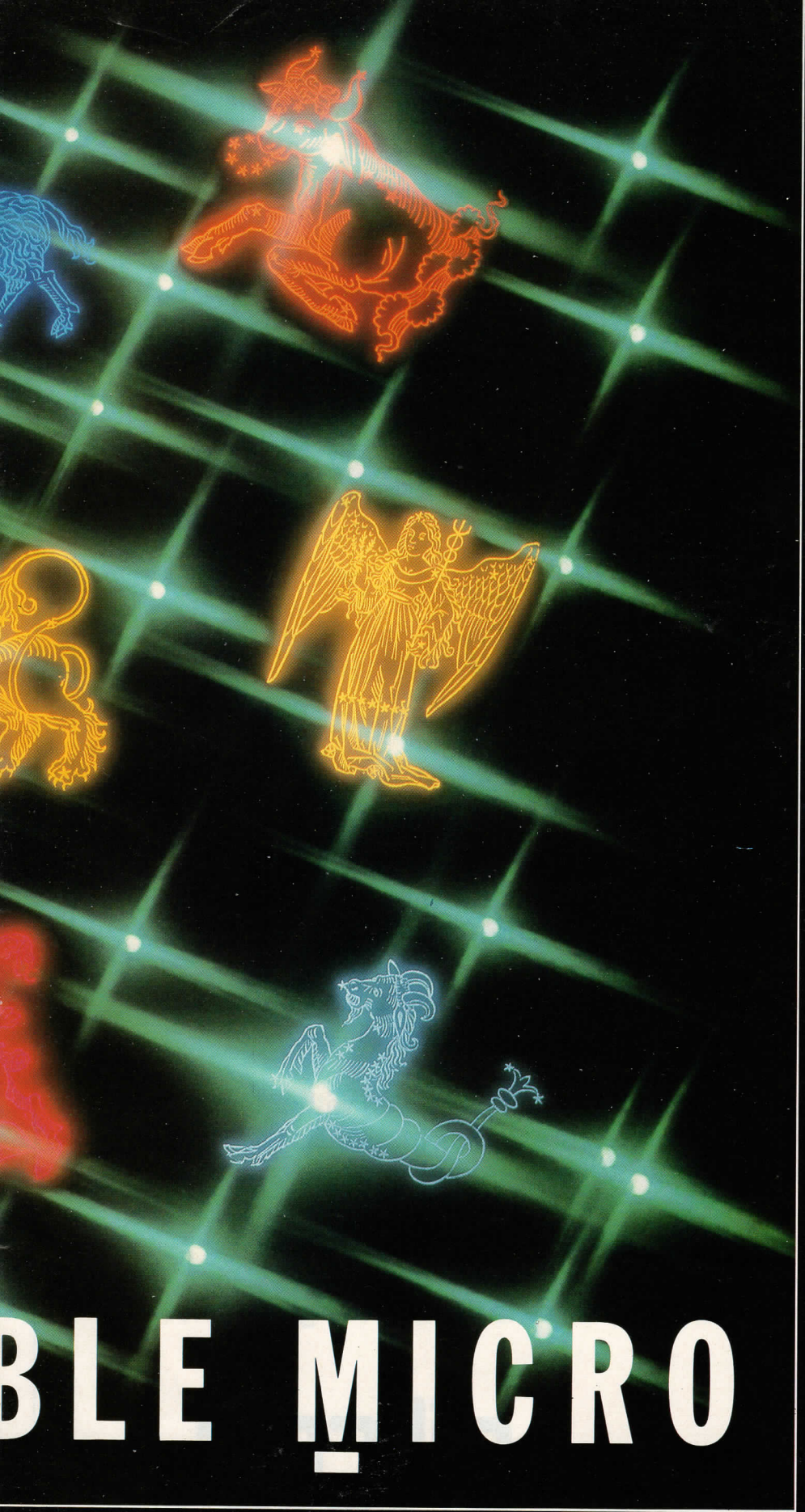
THE UNPREDICTA

Philip Staniforth charts the heavens with his QL.

Most people buy a home computer for one specific function: kids go for games, writers for word processors, and businessmen for financial packages. Once these applications are put aside, looking for something interesting, creative and useful to fill the vacuum can be a problem.

Here Astrology programs come into their own. The complicated mathematical calculations needed to accurately ascertain the correct positions of the planets in the sky at any moment, past, present, or future are tailor-made for computers. At the same time it can be fascinating to link interpretations of personal characteristics and psychology to the planetary positions at birth.

Since the advent of the cheap home micro with a memory bank of 16K or more there has been a proliferation of Astrology programs for every make



BLE MICRO

PHOTOGRAPH BY TERRY BEDDIS

of computer. In general these programs calculated the figures and ignored their interpretation, the latter demanding not only a thorough knowledge of Astrology, but also the ability to synthesise the results into a coherent and presentable framework. No easy task, even for a good programmer and Astrologer working in conjunction.

The few programs that have attempted an interpretation are almost always 'flawed'. Either they have been written on a computer with too little memory so only sketchy and basic read-outs are given, or a big mainframe has been used that presents you with a hundred page read-out so full of contradictory information that you don't know where to start or what to believe!

We should, at this point touch on the theory behind Astrology itself. It is a vast area that embraces many disciplines from Astronomy, mythology, and philosophy through to modern day psychology. The belief that the movements of the 'stars' in the heavens are connected to and affect the lives of ordinary people on earth, is an idea that has refused to lie down and die. Irrespective of persecution and scepticism those who hold by this belief are to be found throughout history. We should remember that nearly all the major astronomer-scientists from Ptolomy through to Galileo, Copernicus, Kepler, and Newton were well versed in the arts of Astrology, and accepted it as normal. Indeed it was taught in Universities throughout Europe until around the 17th century, and at the same time every noble court employed its court Astrologer to advise the ruler on the events of the times. Documented Astrological records of planetary movements stretch back to 1700 BC to the era of the Babylonians. A continuous thread with many ups and downs can be traced from then until the present day (nearly 4000 yrs). Astrology's heritage, then, is rich and varied.

An exciting link between computers and Astrology exists in the area of research. Huge databanks of birthtimes are being built up to carry out statistical surveys into such diverse areas as occupations, crime patterns, suicides, seasonal births, behaviour traits associated with various signs and planets, illness and diseases, stock market trends. Out of this research some very interesting results are turning up. In the case of occupations, a definite link between planetary positions and profession has been established, much to the amazement of the sceptics, and even of those carrying out the research itself. Also, it is a known fact that the crime rate rises around the time of the full Moon with violent crime coming to the fore. The search for a link between planetary cycles and fluctuations in financial markets is being pursued vigorously by many groups of Astrologers keenly interested in the potential benefits.

'Synastry' the art of comparing your chart with that of someone else and finding the links that are positive and negative is a practice well advanced in the Astrological world. One day we will probably see Computer Dating services using comparisons between a couple's birthcharts. Indeed it is not unknown now for businessmen who are 'believers' in Astrology to have the chart of a prospective partner or customer checked out to see any potential problems in ▶

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the relationship. The fact that you can construct detailed pictures of a person's character is the strongpoint of Astrology. Psycho-analysts often use an Astrological analysis to supplement their work with a patient.

Predicting future happenings and events via the 'Transits' of the planets is Astrology's weakest area. Many foolhardy and ridiculous proclamations have let down the art of Astrology giving it a poor reputation. Astrology is however all about Planetary cycles and with the aid of computers we can now easily look back into the past and correlate historical events to Planetary positions in the signs of the zodiac, and thus look out for any recurring patterns in the future that may indicate similar events.

Writing an Astrology program is a very complicated business. To begin with, there are two ways for working

out positions of the planets in the Zodiac. One is called the Tropical Zodiac, the other is called the Sidereal Zodiac. The Tropical system relates the inclination of the Earth's axis to the Ecliptic or orbit as a whole, while the Sidereal Zodiac relates the orbit of the Earth and the Ecliptic to the background of the Stars. Suffice to say different Zodiac sign positions for the planets are reached via the two systems. The Tropical system is mainly used in Western countries, and the Sidereal in Eastern countries. The Sun passes into a new Zodiac sign around the 21st of each month. So, if for example you were born between the 21st of July and the 21st of August, in Western Astrology you come under the Sun sign of 'Leo' whereas in Eastern Astrology you would fall under the sign of Cancer. Both systems are valid they just have different starting points.

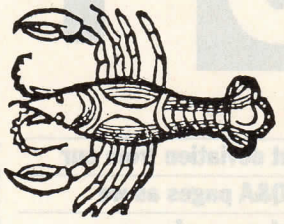
The first step in the search for planetary positions is to calculate the exact time you want to use as a fraction of the 20th century. For example, the Century Fraction for 7.13 am on the 1st January 1986 = 0.8600082 (we'll explain why, later). This fraction is then multiplied by the number of degrees travelled by the planet in the whole of the century and added to the position at the start of the century. This result is then 'fine-tuned' using a long complex algorithm involving the eccentricity, inclination and the gravitational attraction between the planets. To convert these heliocentric positions to geocentric is a simple matter of subtracting the X,Y,Z co-ordinates of the earth from those of the Planet involved. The entire calculation process can be performed in QL SuperBasic in about 10 secs for nine planets, giving an accuracy to 1 minute (1/60) of arc. Stripped down to the barest minimum an Astrology calculation program can be condensed into about 54 to 60K Basic. This requires about 400 statements, a routine for the input of the date wanted, and the planetary algorithms. In mahine code the process could be considerably faster.

Accuracy on the QL is no better and no worse than most other computers. The real bonus for QL users is in terms of speed. The same program running on the Spectrum is 4 times as slow, whilst on the Commodore 64 and the Amstrad it can take up to a minute or more. (Astrocalc, one of the few companies around producing Astrology software, have fine-tuned their programs to run faster on the slower computers.)

Before computers became widely available the task of calculating positions of planets had to be performed manually using a book called an Ephemeris. This gives one daily position in longitude of the planets over a year, or number of years. You then interpolate between two daily positions by using logorithms to find the correct answer. With practise it takes about 15 to 20 minutes per calculation. A far cry from 10 seconds! Clearly, in terms of accuracy and speed, a computer is hard to beat.

The half-way house for Astrologers at the moment is a hand held calculator capable of interpolating between two planetary positions, but still needing an Ephemeris handy to feed in the daily positions. This takes about two minutes to complete. The capabilities of calculators are improving all the time and the day is probably not very far away when we will see them running Astrology programs independently, using good graphic displays and enough memory to save plenty of data.

The first step in producing a calculation program is an input routine to enter the time and date of birth, and the entry of Latitude and Longitude to 'fix' the terrestial point we are working from. It's essential to remember that Astrology is 'Earth centered' and to all intents and purposes the Sun and the planets are revolving around the Earth. This of course is not the case but the Astronomy of the planets is as seen from the Earth. Day, Month, and Year can all be entered as integers separately via the INPUT command. Latitude and Longitude are entered in Degrees and minutes and can be



broken down as shown in *Listing 1*. It is slightly more complicated to handle as we are dealing with directions, *North, South, East* and *West*. Latitude lines divide the Earth's surface from North to South, being 0 degrees at the Equator and spreading to 90 degrees in both directions to the Poles. Longitude lines start at 0 degrees from the Greenwich meridian in England to 180 degrees in both directions meeting at the opposite side of the Earth at the International date line. South Latitude and East longitude must both be converted to minus. At the same time the Latitude must also be expressed in terms of Radians. The degrees and minutes of both are entered separately then converted into a whole decimal fraction. *Listing 1* does not take into account all the Print statements necessary to show "Day, Month, Lattitude" etc, on the screen for the convenience of the user.

Listing 1.

```
1000  INPUT ;LAT_DEG
1010  INPUT ;LAT_MIN
1020  LET LAT = RAD(LAT_
      DEG+LAT_MIN/60)
1030  PRINT "<N>orth or
      <S>outh ? : " :INPUT
      NS$
1040  IF NS$ INSTR"Ss"
      THEN LAT= -LAT
1050  INPUT LON_DEG
1060  INPUT LON_MIN
1070  LET LON = LON_DEG+
      LON_MIN/60
1080  PRINT "<E>ast or
      <W>est ? :" :INPUT
      ;EW$
1090  IF EW$ INSTR"Ee"
      THEN LON = -LON
```

In the next part we hope to review the first Astrology software to come out on the QL, namely Digital Precision's "Super Astrologer" program. With an intepretation of your Birthchart also included the program would seem to be a brave and ambitious attempt but will it work?

Also in the next issue two expert Astronomer/Astrologers Michael O'Neill, and Bray Braden will discuss a lot more useful routines and procedures that go to make up an Astrology program for the Sinclair QL. The Tropical Zodiac and calculations for dates this century will be used.

OPEN CHA

A slight deviation from our usual Q&A pages as we present some of your comments and advice for other readers. Open Channel, QL User, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU

Parisienne Parlez

I am the owner of a Sinclair QL of the latest design (JS Rom, Psion 2.3) and, on the whole, I am astonished that so powerful a system has troubles to get sold at £199.00 even at £299.00, it would be fine. Indeed, Sinclair Research is better at designing things than selling them.

Concerning the QL, its hardware is sound, SuperBasic is very efficient and versatile, and the Psion software are very interesting. Even the so-maligned microdrives work quick and well, as long as they are understood to be superfast tape-recorders, not two-dimensional access disks.

Yet, nothing is perfect and I think some of the following weak points may hinder the success of this computer:
1) The User guide is not well-written, and it may be very confusing for beginners. Some notations, especially those used in the Keywords section, are not explained, and not understandable. By chance, examples are given, which put right what is confused by the explanations, so long as these examples are not themselves confused by misprints or syntax errors.
2) I use my QL with a good amber monochrome monitor, for which blue and red are black, green is dark-grey and yellow is white. But Psion software heavily use red to convey messages, so that some of these messages are lost for me. Maybe those colours look fine in showrooms, but they don't go well with business software and monochrome monitors.
3) I feel a little overwhelmed to come from my previous ZX81 with 16K to a QL with 128K, and get hindered by some new limitations: why should a DIM statement accept no number greater than 32K, or a string DATA line be shorter than 256 bytes, or the whole variables area be less than 64K?
4) I imported my QL from England to France, where the 1 year guarantee no longer applies (let it be so!), and where the mains provides power in a different way. I have modified my French mains to mimic English and my QL seems to work. Yet its power supply is a sensitive beast: When it is given 220 volts instead of 240 volts, it grumbles and heats, and the screen picture gets unsteady. This is a little troublesome, since voltage changes of that magnitude may happen daily in my district.

Yet, these points (and a few others) are minor ones, and may be easily overcome by experienced users. Things are different for true beginners: for them, even the QL's strong points may be troublesome eg. SuperBasic has so many features that a true beginner may get lost; each Psion software deserves a long study.

As we say in France: best is the enemy of good! But it would be a pity if the QL fails for being so good.
G W Feler
Paris, France.

Bad Business

I am currently the proud possessor of a non-working QL, three months out of warranty. Having spend four days trying to get through to Sinclair by 'phone with no success, in desperation I posted the machine to them, with a covering letter explaining the problem. Two weeks later the QL was returned, unrepaired, with a letter informing me that the machine was out of warranty and quoting a 'service charge' of £40 (payable in advance) for the repair. This procedure seems to be to be the height of lunacy: why not simply request the remittance by letter? Should I decide to have Sinclair repair the machine (which I certainly will *not* do if I can get it repaired locally), I will incur repeat postage/insurance costs totally unnecessarily, not to mention the unnecessary wear and tear on the machine of two additional journeys in the post. One can only conclude that Sinclair do not really want the business.
S J Wilkinson (Ms)
South Wirral, Cheshire

Unparalleled Pride

I am writing to you in praise not only of my new QL, on which the PSION packages (v2.3) are excellent, but also of the printer which I obtained at the same time, a CENTRONICS GLP, both available from DIXONS.

The printer is excellent value for money being capable of draft quality at 50 cps and NLQ on a printer costing less than £170, including both Parallel and Serial interfaces as standard with a tractor feed as an optional extra for less than £20.

I use a standard DIXONS QL Serial Printer Lead, which requires no modification. The dip switch settings are as follows (O is ON, X is OFF).

	8	7	6	5	4	3	2	1
Switch 1	X	X	X	O	O	O	O	X
Switch 2	O	X	O	X	X	O	X	O

This makes the printer 9600 Baud No Parity with Handshaking. The printer can now be used using ser1h with the printer lead in ser1.

In order to obtain a £ sign using the PSION packages set TRANSLATE 1 to £,<CTRL><SHIFT><comma>.

As the printer is capable of NLQ it is useful to be able to switch it in without re-installing a different driver for Draft and NLQ mode. The method I use is to select two characters that you will not use in your documents and use them as the switches. ie using { for NLQ and } for Draft:

TRANSLATE 2 {,ESC;x;1
TRANSLATE 3 },ESC;x;0

Make sure all these are entered as characters as shown in the install_bas program.

The rest of the PSION install parameters are listed below:

BOLD ON:	ESC;E
BOLD OFF:	ESC;F
UNDERLINE ON:	ESC;–;1
UNDERLINE OFF:	ESC;–;0
SUBSCRIPT ON:	ESC;S;1
SUBSCRIPT OFF:	ESC;T
SUPERSCRIPT ON:	ESC;S;0
SUPERSCRIPT OFF:	ESC;T

Please note that the NLQ switches described above are NOT printed and for the purpose of this letter the switch has been removed. You must allow for these new not printed characters.
G Slatter
Stroud, Glos

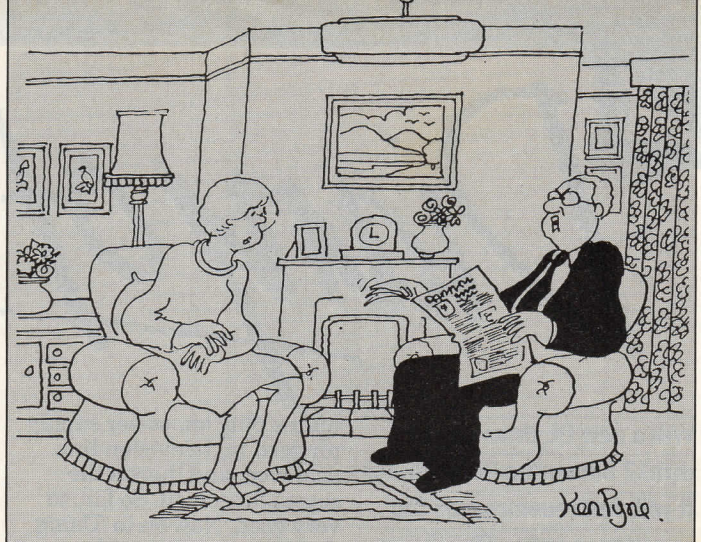
Lock Up Time

With reference to your November issue of *QL User* and the letter from David J. Howard in Open Channel with regard to QL "Lock-Up". I agree whole-heartedly with Mr. Howard's observations that the QL Locks-Up when over-heating is present. In fact during the Summer months this became a very big problem. If you check with Mr. Howard you will probably find that the over-heating occurs in the micro-drive area. This in turn leads to QL Cartridges becoming warm and causing severe stretching of the tapes. Very soon after this the "Bad medium" report comes up. The unwise and gullible then place back-up cartridges in the microdrive to continue any programming work not realising that the over-heating will swiftly do the same to any cartridge.

In fact without the help of Talent Computer Systems of Glasgow and their Cartridge Doctor I nearly lost 4 years accumulated work on a program that began life on a ZX81, which was then re-written for the Spectrum and finally for the QL.

My specialist program demands that the QL be left switched ON permanently so that the SDATE facility can be utilised in calculations. However this can't be done at the moment so the SDATE has to be re-set every time the QL

N N E L



"I'm no fun anymore? — what do you think I am? — a personal computer?"

is switched on. This is a small price to pay as against repeatedly losing four years work. My heart is not that strong.

What is Sinclair going to do about this major problem.
Neville Cresdee
Gosport

Amateur Owner

I am the owner of a Sinclair Spectrum and a Sinclair QL. I am also a licensed radio ham.

Many of us radio amateurs are also interested in computing – the two hobbies seem to go hand in hand.

Using the ZX Spectrum it is possible to directly connect the tape output socket to the radio transceiver and transmit programs over the air. At the 'other end' the radio receiver's headphone socket is connected directly to the tape input socket on the Spectrum and in most instances the program can be listed and run or saved to cassette.

I would very much like to be able to send programs from one QL to another in a similar way. A problem arises with the QL as there is no tape or other audio output.

Can anyone please provide details of how this can be achieved?

I look forward to hearing from anyone who can help.
J Cooper (GWOACH)
Mid-Glamorgan

Quill Printing

I bought my QL several months ago, mainly on the strength of the Psion version 2 packages for business use. While I enjoy Basic programming as a hobby, I have not had the time to really try out SuperBasic yet. I think I'll miss the full screen editor and other productive programming features of my Spectravideo MSX machine. The arrival of a SuperBasic compiler would help to redress the balance though.

I have now used Quill extensively and find it excellent. I miss the ability to skip the cursor straight to the beginning or end of a line; is there a facility I'm unaware of? I used to find it frustrating to have to repeatedly set my preferred options for Design, Footers, Margins, etc on each new document. I now have all these set in two "empty" documents on my Quill cartridge; one called set11_doc for 11 inch continuous paper and one called seta4_doc for full A4 sheets. I now load one or other of these before starting a new document.

I have a Super5 EP-1201 printer with a Miracle Systems Centronic interface. I believe the Super5 brand printers are identical to Panasonic. It appears to be Epson FX compatible. I seem to get away with the default Open Ser1 parameters for listings. The printer dip switch settings are:

1–1	on	} standard mode
1–2	on	} (can be set to various IBM graphics modes)
1–3	off	no auto linefeed with CR
1–4	off	don't skip perforations
1–5	on	} USA character set
1–6	on	} (7 European sets available)
1–7	on	}
1–8	off	8 bit
2–1	off	mode switch 3rd position sets to compressed print ("on" sets function of switch to change to proportional spacing)
2–2		(unused)

Besides its robustness and good speed (120 cps, 29 cps for NLQ), I find very useful the hardware switch to change from standard to NLQ to compressed or proportional. While these can be switched by software, it is very convenient to simply switch the printer manually from draft to NLQ.

I prefer to do most of my printing at one and a half normal spacing. Consequently I have made the following changes to the Epson FX-80 printer driver:

Lines	44
Preamble	esc,Q,esc,A,18 (initialise printer, set spacing to 18/72 inches)
Postamble	CR (this flushes out the final print line if I don't press Return after the final line in my Quill document)

I plan to experiment with some of the translate codes to switch to and from expanded, compressed and italic print.
Michael Rouse
Auckland, New Zealand

Curiouser And . . .

Having had a QL for over a year now it came somewhat as a surprise to find a peculiarity.

Every time I type [CLS 100] what appears to be the buffer empties onto the screen for all to see. Once this happens one can edit it, add to it or leave it by pressing [ENTER]. If it is added to, an error "buffer 4" appears and the only way to leave is by pressing [CTRL + C] together.

It doesn't stop there either. CLS and quite a few other numbers including negative ones can be entered and not returned with an error. Most, notably [CLS 99], which suspends the cursor (?) until [ENTER] is pressed a few times.
Richard Griebler
London SE14

Transmitted Ease

Having recently graduated from a Spectrum to a QL, I was interested to read the article "Spectrum Connections" in *QL User*, October 1985. I have a peculiar need to download programs and files from the QL to the Spectrum in order to list to my trusty teletype.

Contrary to the impression created by the article, I successfully make use of the network to communicate between the two machines, which consist of a 'JM' version QL and a version 1 Interface 1. For those with equally perverse needs (or just the plain curious) I offer the enclosed listings.

```
100 REM ---SPECTRUM PROGRAM (RECEIVER)---
110 REM OPEN STREAM TO TELETYPE
120 FORMAT "T";11;: OPEN #3;"T"
130 REM MAKE SPECTRUM STATION #2 ILLEGAL
140 FORMAT "N";2: LET MS="99"
150 REM RECEIVE LINE FROM STATION: #1
160 OPEN #9;"N";1
170 INPUT #9;LS
180 CLOSE #9
190 REM DON'T PRINT SAME LINE TWICE
200 IF LS(1)=MS THEN  GO TO 150
210 REM OUTPUT TO SCREEN AND TELETYPE
220 PRINT LS(2 TO );: LPRINT LS(2 TO )
230 LET MS=LS(1)
240 GO TO 150

100 REMARK ---QL PROGRAM (TRANSMITTER)---
110 REMARK MAKE QL STATION #1
120 NET 1
130 REMARK INITIALISE LINE COUNTER
140 LINE-COUNT = 9
150 REMARK GET NAME OF FILE TO BE LISTED
160 CLS: INPUT "FILENAME > "!FILE-NAME$
170 OPEN-IN #5,FILE-NAME$
180 REMARK TRANSMIT LINE-BY-LINE
190 REPEAT EVERY-LINE
200   IF EOF(#5) THEN EXIT EVERY-LINE
210   INPUT #5; LINE$
220   PRINT LINE$; SEND(LINE$)
230 END REPEAT EVERY-LINE
240 CLOSE #5
250 STOP
500 DEFINE PROCEDURE SEND(STRING$)
510   REMARK DOUBLE-UP ANY EMBEDDED QUOTES
520   DUMMY$ = "": MARK = 1
530   IF STRING$ = "" THEN STRING$ = " "
540   FOR INDEX = 1 TO LEN(STRING$)
550     IF STRING$(INDEX) = '"' THEN
560       DUMMY$ = DUMMY$&STRING$(MARK
          TO INDEX)
          MARK = INDEX
570     END IF
580   END FOR INDEX
590   DUMMY$ = DUMMY$&STRING$(MARK TO)
600   REMARK SEND TO STATION #2
610   OPEN #6,NET0-2
620   PRINT #6; LINE-COUNT&DUMMY$; CHR$(13);
630   CLOSE #6
640   LINE-COUNT = (LINE-COUNT+1) MOD 9
650 END DEFINE
```

Note that the file is transmitted line-by-line since the QL uses CHR$(10) as a terminator whereas the Spectrum uses CHR$(13). Each line is prefixed with a single digit count in order to allow repeat transmissions to be detected and ignored if required. Note also that in order to transmit programs which contain lines with embedded quotes, any such quotes must be duplicated before transmission.

Using these techniques it is equally possible to transmit data from Spectrum to QL.
G P Clark
Derby

Diary of a QL User

Will a new QL drive you to drink? Samantha Mead thinks it will, but recommends the experience in her QL (dipsomaniac's) diary . . .

Day 1. *10 am* Unpacked QL and a wad of paper purporting to be the User Guide. First tremor — does it really involve this much work? Identified microdrive cartridges. Discarded leads for networking system. My QL not even talking to me yet, let alone other computers. Had cup of coffee *(Just coffee — Ed?)*. Is this the beginning of computer literacy?

10.30 am First technical encounter — ring binder and numerous pages of instructions — goes very well. Experience surge of confidence, Sir Clive not such a bad bloke after all.

Open manual at page 1, Introduction, and understand everything written. So far, so good. Clear diagrams, ports and connectors easily identifiable, everything fine. Mains plug on, power supply plugged in, television link achieved, and there's the copyright screen. So far, so very good. Now on to 'Using the QL' . . . and a quick cup of coffee.

11.45 am Keyboard. ENTER, SHIFT, CAPS LOCK, all familiar, all working well. Who said 16-bit machines were sophisticated? Onto DELETE . . . 'Hold down CTRL'. CTRL?!? There isn't one! There must be — if I just hold down the left-hand ALT key and press the arrow . . . ah, yes. I see. CTRL is in fact marked ALT, and ALT is marked ALT, so all I have to do is remember that ALT is CTRL except when it's ALT — quite easy really. NOW I see where the sophistication comes in. Wonder how many other QLs left the factory with two ALT keys?

2.00 pm Now for the good bit. Word-processors are the only thing I use on any computer. Quill, much talked of as an excellent program, is clearly the best starting point for me. Turn to 'Introduction to the QL Programs', page 8 of the manual's first section, to be told I should make back-up copies of all original programs. Furthermore, I should never use the original program, except when copying it!?

But . . . I haven't got any blank cartridges to make back-up copies on! Does Clive really mean I can't use Quill until I trek off and buy some more microdrive cartridges? Coffee not strong enough this time. One gin and tonic later, turn to Beginner's Guide, page 1 chapter one 'Starting Computing'.

2.30 pm Write my first program in SuperBasic: 'Confusion reigns supreme' — it runs! Progress to using the QL as a glorified calculator.

2.45 pm Hit first major snag. *(That didn't take long — Ed!)*. Have learned difference between Direct Command, when statements are put on the screen and answered immediately, and Programming Mode, when lines are numbered and stored until the RUN command is typed in. Have learned rudiments of EDITing my productions (all three lines of them), but have failed to find out why the results are displayed in the top left-hand corner of the screen, on top of the program lines! Consequent mess on screen makes it difficult to read the results or see how I got them there. Much reading of manual, backwards and forwards, no solutions forthcoming. End of chapter 2 heralds deep depression.

3.15 pm Call in expert. "Oh, yes", says he, "they wrote this manual using a colour monitor, not a common or garden mono TV. Since monitor mode gives a split screen, monitor users don't have this problem. Since you're using the economy TV mode, you do two things. Have a gin and tonic. Then insert extra line before PRINT statement, to CLEAR screen before RUNning program." Sure enough, listing disappears, result of program displayed (still in top left-hand corner) alone on screen. LIST command puts program listing back on screen in the centre, nice neat solution. Alternatively, use monitor mode instead of TV mode recommended by manual, and put up with not being able to read the whole of each line of your program. Why didn't Clive tell me himself? Restore bruised confidence by dark mutterings in corner. Feel better. Bruise confidence once more by attempting Self-Test on Chapter 2. Excellent feature of manual, this, I just wish I could remember the answers.

Day 2. *10 am* Settle in for long session. Chapter 3, Drawing on Screen, discover mono TV has another disadvantage . . . no colour. Wrest colour television from family, set up and start again. All goes well until exercise on chapter three invites me to write my own program for random lines, and I naturally call my program segment 'line'. Program refuses to RUN due to "bad name". Discover that 'line' is a

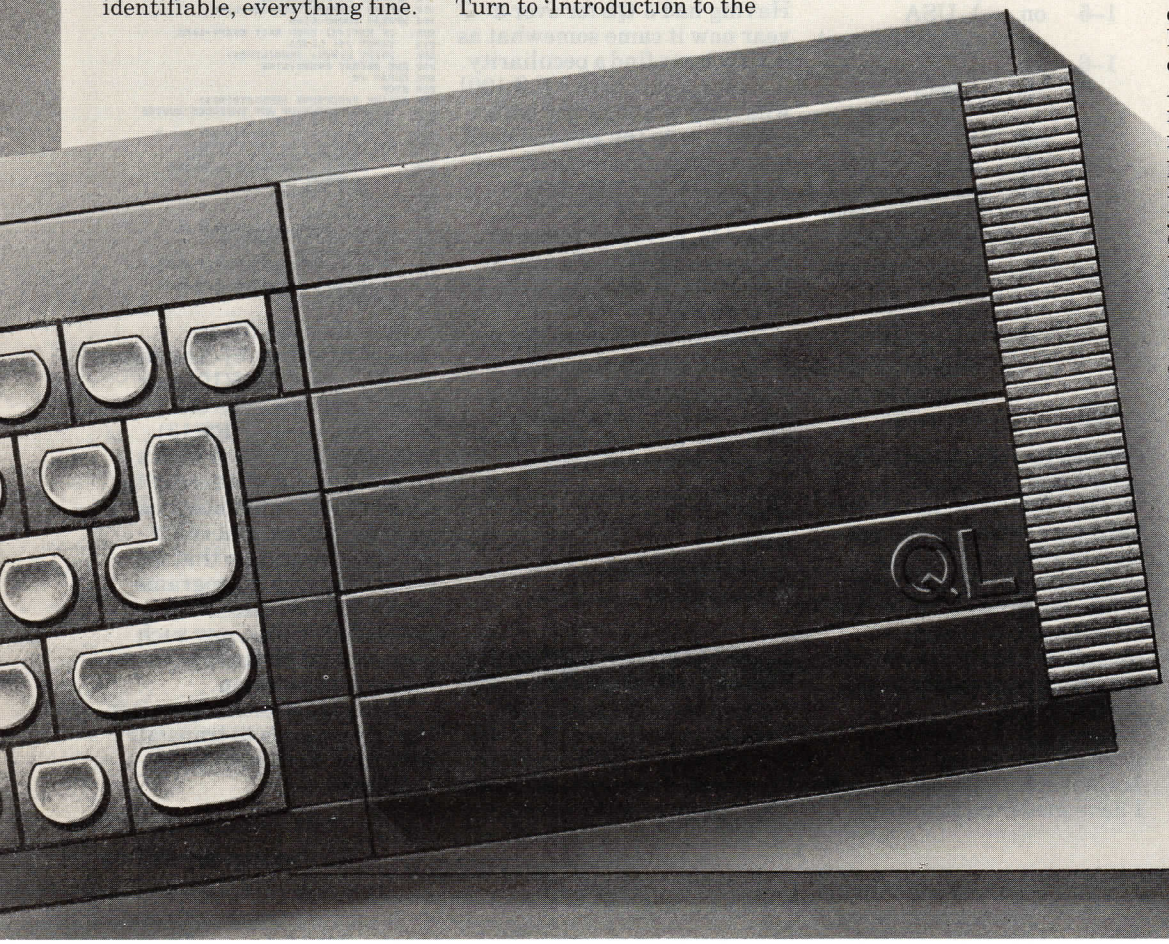


ILLUSTRATION BY STEVE DEW

keyword, and cannot be used as a variable. Why have I not been told this before I am asked to launch out on my own? I'm on page 18, keywords are dealt with in a completely different section and I haven't been referred to it! The air turns blue. Rename offending section FRED and program runs. It doesn't, however, produce the required effect because in order to achieve the answer to the problem set on page 18, I need a piece of information tucked away on page 32. No comment. Expert says I can't expect all the information I need to be in order, I just have to grit my teeth and follow up every point until I find it. Send expert out for more bottles of gin. *(Corrupting the innocent — Ed).*

Time unknown (whether due to gin or enthusiasm is not clear). Chapter 4 on Characters and Strings seems straightforward. The only problem seems to be that when I randomly generate combinations of ABC, and instruct the program to stop when it reaches CAB, it doesn't! This highlights one of the fundamental difficulties beginners have with computers: 'Is it me, the machine or the manual, and have I the patience to find out?' Decide I have and am rewarded by Chapter 5 which tells me that I have already begun to work effectively with short programs, and well understand the machanics of running them. On reflection, feel this is probably true.

I have now reached the point of formatting a microdrive cartridge, duly acquired from the high street, and am referred back to the Introduction for instructions (irritating, to say the least). It gets worse. On reading the Introduction, I am told to be careful with microdrives and refer to the Information section for details on how to format! Resist temptation to hurl fragile cartridge through window and turn to Information, currently at the end of the manual. I seem to have strayed an awfully long way from Chapter 5, which started all this. However, matters don't improve as I am taken aback to discover that formatting is not dealt with until the last page of the last section of the manual! I realise that bad publicity in the past may account for a certain diffidence about microdrives, but this is ridiculous.

There is one telling little phrase, "It is good practice to format a new cartridge several times." Expert tells me it's not so much good practice, more in the nature of a necessity. Am less than impressed to be told that the underscore symbol and the minus sign are on the same key, so I must be careful not to confuse them when using the underscore for formatting. It seems to me, as a mere novice, to be asking for trouble to add confusion during a critical operation, but perhaps there's some deeply significant technical reason for it . . .

Proceed to format. All goes according to manual until I format the same cartridge for the third time. Am then told that the capacity is 219/219 instead of 220/221. A fourth attempt reduces the capacity to 218/219, and a fifth confirms that figure. Scurry through manual to be told that several formattings *increase* capacity of cartridge. Decide to call a halt, on the grounds that if it is in fact increasing when the numbers displayed get smaller, then the formatting is working and I've got enough capacity for my feeble efforts, and if the exercise is decreasing the capacity, I'd better stop whilst I'm still in business. Can't as yet find any explanation for this quirk in the manual . . . it's probably entirely obvious to the *litterati* of the computing world, but to me it's one more illogicality in this most logical of modern pursuits.

Just for fun, I ask for DIRectory of my blank cartridge, only to find I've lost *another* sector of storage capacity in the process. Begin to appreciate warning about losing all programs and data if formatting a full cartridge. I seem to be losing them before I've even stored them. Return to chapter 5.

Type in two-line program and SAVE it to cartridge. It takes countable seconds, which surprises me, and reduces the storage capacity figure by three digits. The display which allows me to keep track of how much space I have left is comforting. Standard BBC disks, for example, are much too prone to filling up without warning and store comparatively little data.

Time — no idea Progress to COPYing from one microdrive cartridge to another, and FORMAT second cartridge in microdrive 2. Expert tells me this is fraught with danger, since if I mis-type, I run the risk of obliterating contents of cartridge in drive 1. I do it

anyway, and discover that my second cartridge starts off with a capacity of 215/216, increases on the first operation to 217/218 and is then reduced again to 217/217, where it stabilises. Curiouser and curiouser. However, must not complain since I'm only entitled to a capacity of 200/200, says expert, and anything over that is a bonus.

Mess about for a while with MERGEing programs and reading the general note which tells me once more how important back-up copies of programs are. This is beginning to make me nervous. It is clear that I must use a minimum of three cartridges in order to be *sure* of SAVEing an important program — one to write and store as I work, and two to keep the program when finished. Although I can then reformat the original cartridge and use it again, we're still talking about tying up £4 worth of cartridges for each program. Can't help feeling the sooner Sinclair launch the disk-version of the QL, the better!

Spend countable minutes trying to tidy up a program in the Problems section which looked fine to me in the first place. Move on to Arrays and Loops, only to have everything explained so carefully that it confuses me. In fact, I know more than I think I do, but lack the confidence to do anything other than slavishly follow the manual, which alternates between painful detail and the quantum leap into sophistication which leaves the beginner stranded. It helps at this point to have some human intervention, which reassures me that I am not so inept as all this print makes me feel. Come to the conclusion that, no matter how competent the manual, most learners will benefit from the occasional consultation, even with another learner.

Day 3. *11 am* Heavy night does nothing to encourage enthusiastic approach to today's session. *(Ah, the wonders of alcohol — Ed).* I'm now roughly halfway through the Beginner's Guide to programming, have come to terms with a fair number of keywords and gleaned some interesting things from the Information section as well as making the acquaintance of the infamous microdrive cartridges. So far, I'm quite impressed with the manual and pleased with my progress. I'm nervous of the storage procedures, since they seem to offer too many opportunities for disaster, particularly to those in the first throes of computing, but microdrives are clearly something to which you get used to eventually. That's not to say they're a good idea, but every computer on the market has its drawbacks, and at £200 for the QL, forgiveness comes easily, and cheap!

Now I'm confident the machine is basically friendly, and I have my back-up cartridges, I think the rest of the manual shouldn't provide any great problem (famous last words?) and there's always Quill to provide something a bit lighter — it looks like being three *more* days of enlightenment!

QL LINGUI

The Bristol based company, Metacomco, has been making quite a name for itself with the Motorola 68000 machines. In the QL systems software market, their five language "development kits", though quite pricey, have been receiving some very good reports. We decided to put them all to the test. Are they really superior products?

The five packages we looked at were Assembler, Lattice C, BCPL, Pascal and LISP. One of the most striking features of all these products is their degree of compatibility and interaction – even the packaging looks the same. For instance, whichever language you choose, they all contain the same screen editor format, making the transition from one kit to another very easy.

The on-screen editor runs in a user-definable window, and will work on any ASCII coded file, so there's no reason why you shouldn't use it to edit from other sources, such as a SuperBasic program. The wide variety of commands fall into two main categories: immediate commands and command lines (extended commands). The latter allows for such facilities as block manipulation and search and replace, and these can be grouped, repeated and nested for quite intricate command sequences. Whilst the immediate commands cater for the more usual scrolling, inserting and deleting.

Metacomco's two-pass Assembler is probably the most comprehensive assembler currently on the market, but is also the most expensive. In addition to the expected facilities, including full 68000 mnemonics, the Assembler currently on the market, host of extra features. These include macro assembly, absolute and relocatable code and conditional assembly. It's also possible to link assembly language modules together, or to other metacomco language modules, such as BCPL or Pascal. This is augmented by the XDEF and XREF directives included in the Assembler for referencing external symbols. Linking is particularly useful given the size of the Assembler which overlays to fill up a large portion of available RAM on an

STICS

ILLUSTRATION BY DAVE EASTBURY

unexpanded machine. In addition to the mnemonics for conditional assembly, macros, and so on, ten extra directives allow the user to control the format of the listings.

The two major competitors in the assembler market are the products from GST and Computer One. The former is by no means a bad product, though lacking in some of the panache of the Metacomco offering. The manual is very brief by comparison and, though containing a full editor, it is not as easy to use, especially when debugging. It does however have the advantage of using only about one third the memory of the Assembler Development Kit. The Computer One Assembler is cheaper and quite different from its competitors. Using the multi-tasking features of the QL, the editor and assembler are clearly distinguished as separate tasks running concurrently. Lacking in many of the features of the other two products, such as macro assembly and linking, it is nevertheless very easy to use, and is likely to appeal to the less experienced programmer. As always, the decision will depend on the price. If you can afford the best, then buy it.

Until a few years ago, only professional programmers would be found using C, though it must be said that it wasn't unusual for them to fall in love with the language. These days, the popularity of the language is becoming quite widespread, and it is generally viewed as a logical stepping stone between a high level language and true assembly language programming.

The Metacomco QL C Development Kit is an implementation known as Lattice C, conforming to the C implementation described by Kernighan and Ritchie (K&R – yet another standard). The package is supplied on a ROM, which plugs into the socket at the rear of the QL, and three microdrive cartridges. The first of these contains the runtime editor and linker, allowing code modules to be connected. The other two cartridges contain two distinct compilation stages. The first stage produces an intermediate file which is then finally compiled into relocatable 68000 machine code by the second phase. The reason for performing the compilation this way is to reduce the size of the compiler parts, leaving more free memory. Though a little awkward to use this two phase process can be automated using QLC which prompts the user for necessary information during the compilation.

The only exceptions made to the K&R standard is the inclusion of GETCHID which return a channel identification, often necessary for the use of QDOS1, QDOS2 and QDOS3 which call the QDOS 68000 TRAP instruction. Though rather clumsy to use, these two additions do give access to the majority of QL-dependant features.

The major alternative to the Metacomco product is RATC from GST. This is definitely a budget-line product, however, and I would recommend it to anyone not familiar with the C language. GST RATC has been designed specifically for use on the QL, and includes a range of QL-dependant instructions, making it easier to use for the beginner. On the other hand, Lattice C is a portable system, designed for more professional use.

BCPL is still a little known language amongst the home computing fraternity. However, the fast, compact code produced by the language have long made it popular, much like C, as a high level alternative to assembly language. The package is supplied on a single microdrive cartridge including the editor and linker for linking separate BCPL modules or Metacomco Assembler segments.

The BCPL program is compiled directly into 68000 machine language. This must then be linked with the runtime library, and any other modules, to produce the final program. This can then be run using EXEC or EXEC_W, enabling BCPL programs to be multi-tasking, if required.

Unlike their Lattice C product, Metacomco's BCPL includes not only the standard functions, but also a comprehensive range of QL-depen-

▶

The fine Metacomco Development Kits — exceedingly nice if you can afford them!

dant instructions, allowing simple use of windowing, graphics, character founts, time and date, and so on.

The QL Pascal Development Kit is particularly notable for conforming to the ISO standard. To the layman this merely means that the system is consistent with international standards, ensuring the Pascal programs written on the QL are readily transferable to any other computers running a standard system.

The package is supplied partly on ROM, with the runtime editor and compiler on separate microdrive cartridges. As usual, there's a hefty tome accompanying the software, detailing the use of the editor, complete syntax of the language, extensions and a couple of example programs.

This implementation of Pascal has been written using a mixture of BCPL and 68000 assembler and an EXTERNAL directive is included to allow linking between modules from the different languages.

The single pass compiler produces pure 68000 code, rather than the intermediate p-code generated by many products. This means that the final code, which is run using EXEC or EXEC_W and does not require the plug-in ROM to be present, will run faster than the code produced by many other systems.

Naturally, the ISO standard Pascal doesn't allow the use of QL-dependant features, and an EXTEND directive is included which allows a number of ISO extensions to be usable. One of these extensions is QTRAP which allows information to be passed to and from the 68000 TRAP instruction. Though a little unwieldy, this effectively gives access to the majority of QL facilities. Another very useful extension is INCLUDE, which allows additional program segments to be included at compile time, permitting the user to create his own library of routines. A set of extension graphics routines is supplied which can be inserted using the INCLUDE statement, giving easy access to windows, plotting, random numbers, time and date, and so on.

The two-pass Assembler is probably the most comprehensive on the market.

This is by no means the only Pascal system available, though the only package which can really compare with it is UCSD Pascal from TDI Software Ltd, which costs the same. For my money, I'd prefer the metacomco product, which has the more acceptable standard, and is compatible with Metacomco's wide range of other languages. For a cheaper alternative, Computer One Pascal is worth looking at, though it's not really in the same league.

Though previously sparsely used, LISP has become quite popular in recent yars, mainly due to its inclusion in research and development within the field of artificial intelligence.

The decision depends upon the price — if you can afford the best, then buy it.

Supplied on a single microdrive cartridge, Metacomco LISP is, as with most, an interpreted system. Compatible with Acornsoft Lisp on the BBC micro, this version offers quite a few extra functions and large 16-bit numbers.

The structure and format of the LISP language is very simple, and it's not necessary to have more than the bare essential commands from which to work. It is intended that users build their own set of LISP extensions using these core commands, and from these extensions write the programs. Nevertheless, it is usual for LISP packages to include a range of the more common routines. Metacomco have included a fairly comprehensive, tough not excessive, range of core instructions, comprising all the structure manipulation commands normally found. Supplementing these are turtle graphics, a pretty printer to format the often garbled listing (brackets everywhere!), a trace function to aid debugging and a garbage collector. You're only likely to find the latter useful if you intend to write pretty phenomenal programs, given the memory available on the QL.

Metacomco software is admittedly quite expensive. Given the new low cost of the QL, the Pascal and Lattice C products are each half the price of the machine. Having said this, if you can afford them, they are definitely worth the money, emerging as very professional products. The degree of interaction possible by linking modules from different packages is well thought out and undeniably useful, allowing most code to be written at high level, with time critical modules written, say, using the Assembler package. As a final note, would-be software developers will be pleased to hear that the Pascal and Lattice C packages both produce public domain software. This means that any programs produced using this system, along with their runtime libraries may be freely sold, without any obligation to Metacomco.

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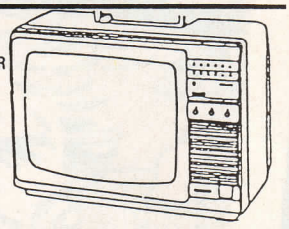

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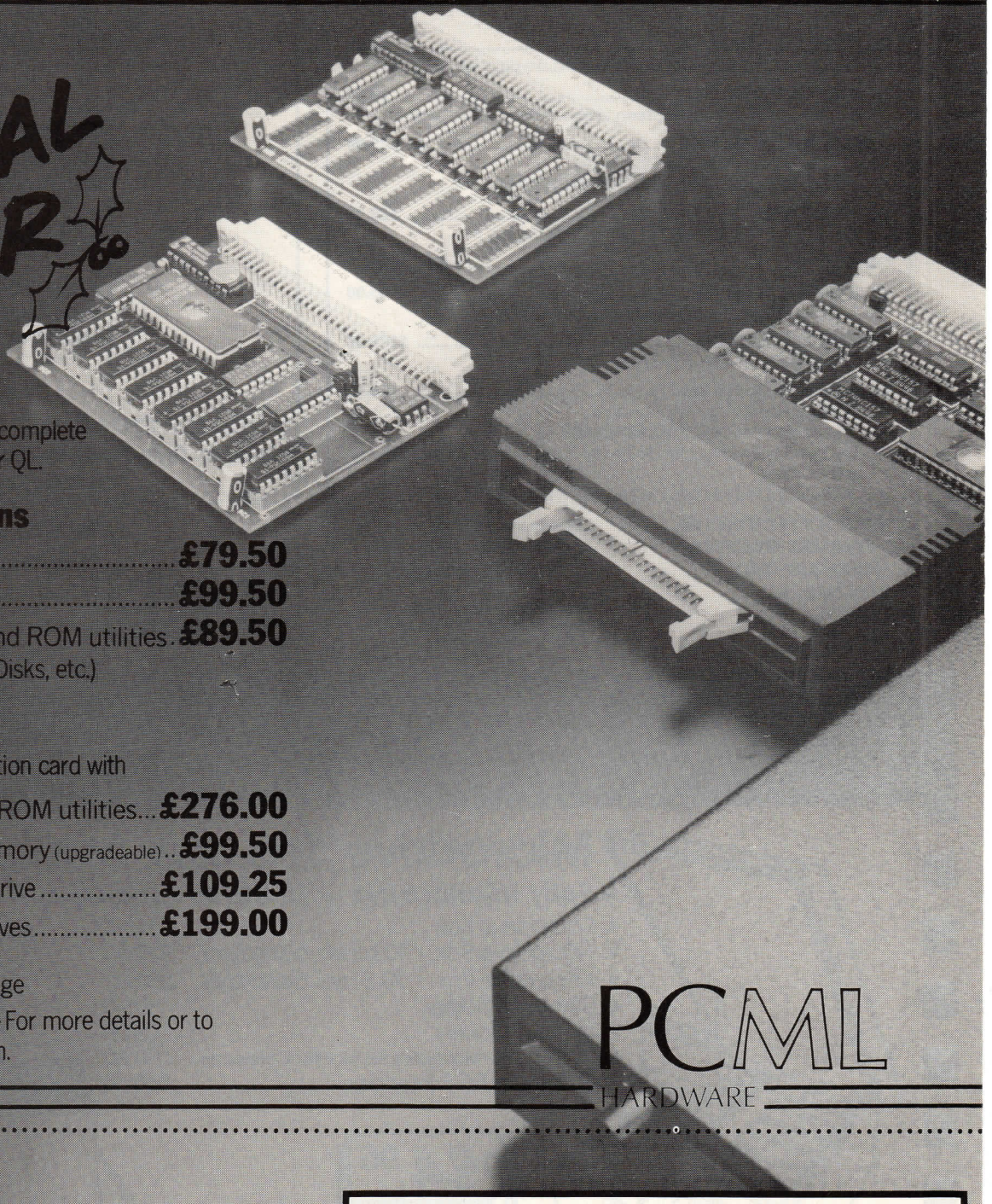

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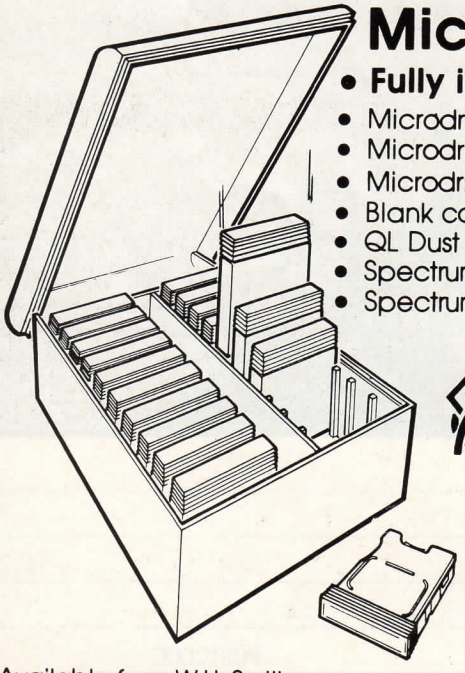

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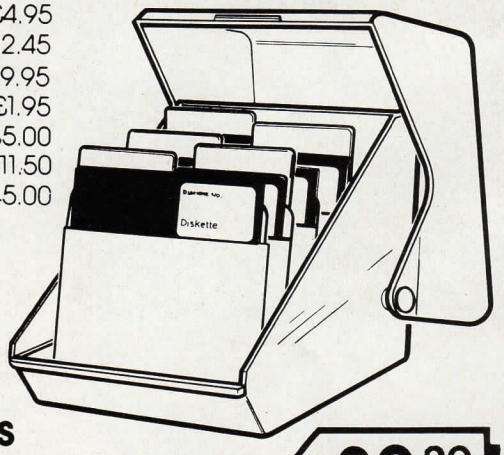

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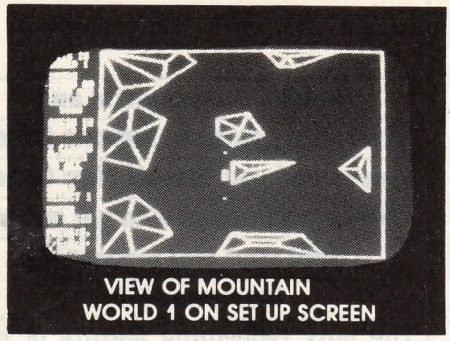
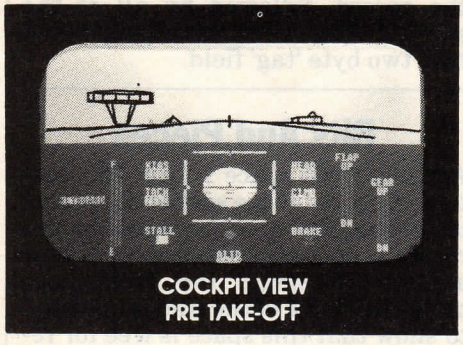


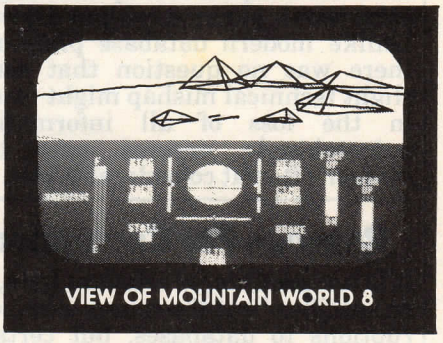
VIEW OF MOUNTAIN WORLD 1 ON SET UP SCREEN



COCKPIT VIEW PRE TAKE-OFF

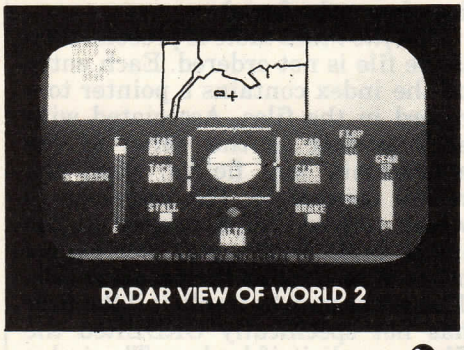
Once in the cockpit with your seat belts firmly done up start the engine, lower the flaps, increase the revs and with releasing the brakes your actually moving down the runway!! As you clear the runway the scene of the world your in, comes into view! Bridges, mountains, power lines, towers, everything is there in this realistic simulation. You can even fly from one world into another! Imagine taking off and flying under a power line then into a treacherous mountain world and landing between 2 mountains, re-fuel, take off again and into another world with a low cloud ceiling, now its time to switch to QLF's unique "RADAR" view. QLF features all the major instruments including artificial horizon, altitude, compass climb, revs - plus all the usual aircraft components - flaps - landing gear - trim and rudder - ailerons.

REALISTIC MOVING GRAPHICS



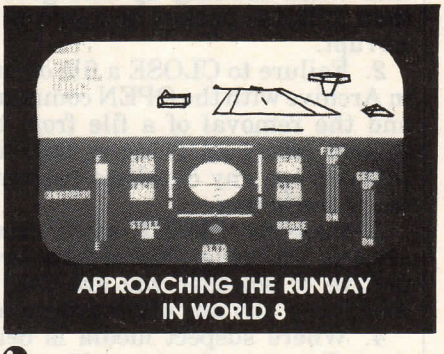
VIEW OF MOUNTAIN WORLD 8

NINE DIFFERENT WORLDS TO FLY AROUND



RADAR VIEW OF WORLD 2

LAND - RE-FUEL THEN TAKE OFF AGAIN



APPROACHING THE RUNWAY IN WORLD 8

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ARCHIVE ON THE

Archive is a powerful and versatile database but one false move and you're lost! Now Chas Dillon explains how to get out of a tight spot and recover the irrecoverable.

The only redeeming feature of the manual filing systems of the pre-electronic era, aside from the fact that they assured employment for innumerable filing clerks, was that the most complex foul up that might occur was a jammed cabinet drawer. Unlike modern database programs there was no question that some slight technical mishap might result in the loss of all information painstakingly entered onto the system, often at considerable cost.

Reasons For Corruption

It is not possible, or relevant here, to be specific about the causes of all corruptions to databases, but certain generalisations can be made. Corrupted files are likely to originate in one of the following ways:

1. A bug in Archive 2.0 ensures that when backing up files greater than 32K, the backed up copy will be corrupt.

2. Failure to CLOSE a file opened in Archive with the OPEN command, and the removal of a file from the system before QUITing or NEWing will corrupt any database currently being worked upon.

3. Pressing RESET when drives are still whirring. This is fatal irrespective of whether you are used to Archive or any any other program.

4. Where suspect media is being used. For example using old or worn out microdrives or substandard disks. With the latter, for peace of mind, ensure that they have 96track/inch certification.

5. A freeze up on the QL arising from the fluctuations/interruptions in mains power, leaky cables and other hardware faults.

Looking at the first cause, unless you have obtained a patch program over Psion's hotline for your Version 2.00 or have updated to version 2.3, the only way to avoid falling foul of the BACKUP bug is to avoid the command altogether and revert to using the SuperBasic Copy command from outside Archive.

As regards causes 2 & 3, these arise from carelessness or ignorance on the part of the user. They can be avoided by following the procedures laid-out in the manual:

1. Never reset the QL whilst a drive is whirring.

2. Never remove a disk or cartridge without first closing all files.

3. Never leave Archive other than by issuing a QUIT or NEW command.

The two remaining causes for corruption arise from machine errors so there is little the user may do to forestall them. Fortunately, they are extremely rare. In the course of running an Archive remedial centre we have found causes 1 to 3 are responsible for virtually all the instances of file corruption.

Having looked at prevention we can now develop a program geared to recovering information from corrupt databases. Because of limited information concerning Archive's workings you should bear in mind that the basis of the program is empirical and that most of the 'facts' presented are no more than educated guesses — deduced from examination of Archive files.

You should also note that the program reads from and writes to the particular disk or cartridge upon which our corrupt database lies. This means that we assume that the disk/cartridge directory is intact. If this is not the case and data is to be recovered from a volume that has a corrupt directory, then the preliminary work required to reconstitute the directory will be covered in our "On disk" series and not here.

Inside Archive

An Archive database comprises 5 elements

Section	Description
1	Control record
	Data Section
2	File data table
3	File index table
4	Free space table
5	File structure table

The *control record* is made up of the first 20 characters of the file. It begins with a two byte RCW (record control word), followed by an eight byte file identifier (usually 'vrmdbf0') followed by four control fields, defining relative starting positions of the subsequent sections of the file.

The data section of the file contains all the records. The order in which they appear differs from the order in which they were defined using the CREATE command in so far as all numeric fields occur at the start of the record, followed by all of the string fields. A record is terminated by a two byte 'tag' field.

Bits And Pieces

Archive pools space within this section of the database so that if a record is deleted, the space occupied by the record is not compressed or otherwise adjusted. Instead, the free space table (section 4 of the file) is adjusted to show that this space is free for reuse. Consequently, when scanning through the file data, the end of one record may in fact not be the start of the next record, but rather a section of free space, which may appear as 'rubbish' — that is, it does not decode sensibly. A new record start point has then to be found.

The *file index table* is present even if the file is not ordered. Each entry on the index contains a pointer to a record in the files. Associated with each pointer is the value of the appropriate key field(s) from the record pointed to. The sequence in which entries are arranged in the index table determines the logical order of records on the database file. This order may be implicit if the user has not specifically ORDERed the file or explicit if he has. The index also has a small control table at the front of it.

The *free space* and *file structure tables* are organised in a fashion similar to the file index. They contain pointers to the free space in the file data area, and the names and type definitions of the database fields, respectively. They are of little significance in the present context.

Even armed with the knowledge of how a database file is organised decoding corrupted data must still be a hit or miss affair. The reason for

MEND

this is that we cannot know for certain the exact extent of the corruption. It may just affect a data record or two but then may just as well affect the control record and all the control tables making it almost impossible to work out where a record starts, where it ends, whether the next piece is a new record, free space or even the end of the file. Indeed, the most complicated parts of the program are designed to uncover exactly this information.

The technique adopted here for recovery is to piece together an export file from data selectively extracted from a corrupted Archive database. Where necessary this 'psuedo' export file may be further edited using a standard text editor (eg, Metacomco's ED), before being IMPORTed back into Archive.

The program relies heavily on the user's knowledge of his own database. The user must first tell the program precisely how the database was CREATed. Using this information, the program then scans and decodes the file data section of the file. As each new record is started, the program displays the contents of the decoded file, and asks for confirmation that the field value is acceptable. Given confirmation, the program will then go on to decode the rest of the record, which is optionally displayed as it is written to the output file.

There are certain tests in the program to check for 'reasonableness' of the data. For example, very long strings may not in fact be long strings at all, but merely appear so because the string controller is corrupt. If these tests are failed, the program displays the decoded value and reports the error to the user, who then has the option to accept the field or invoke one of several corrective actions. This process continues until you opt to 'quit' or the data ends.

Running Commentary

The program conducts a sort of dialog with the user. Prompts are issued and the user responds. Each prompt displays the range of acceptable responses. The first response in this list is always the 'default' — (ie, the assumed response if only the ENTER

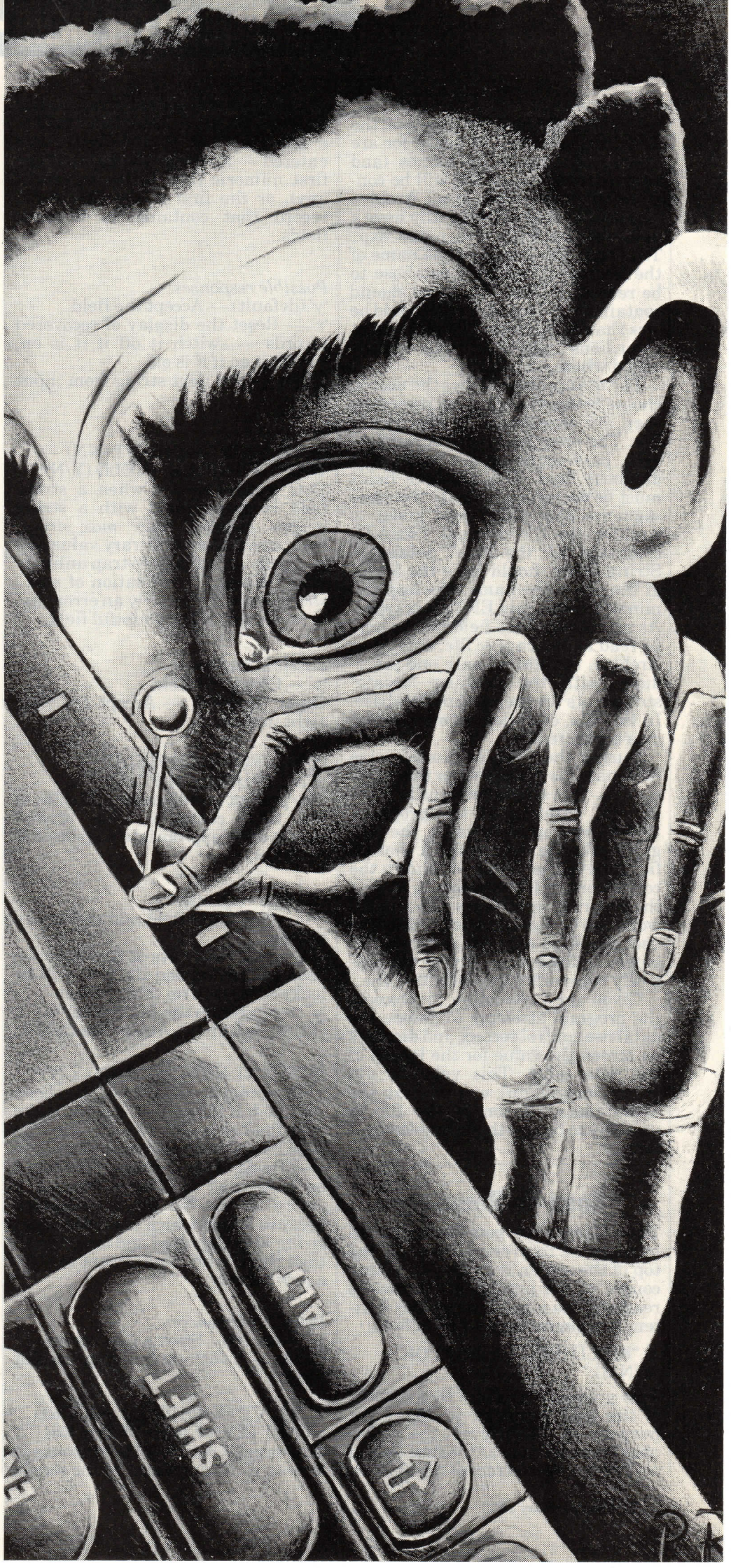

ILLUSTRATION BY PAUL ROBINSON

key is pressed).

Working through the prompts, the first thing you will be asked for are input and output file names (and devices). The output file will be constructed in the form of an Archive 'export' file, and will typically have a name of the form 'dvc_name_exp'. The input file should be the name of the 'corrupted' Archive database to be recovered (NB. The name should contain no underscores and should be less than 9 characters long). Default extensions '_dbf' and '_exp' will be added where necessary.

The next prompt allows the user to choose between displaying records as they are transferred to the export file. The program then loops and on each pass requests the name of a database field. The database fields must be declared in exactly the same sequence that they were given to Archive (in the original CREATE command for the input database). String fields should have the $ sign at the end of the name. The loop terminates when only ENTER is typed. As an option, these field names may be read in from a *proc* file, created in Archive, containing only one procedure, with the defining "create" statements for the corrupt database. In this file, each field name must be on a separate line.

During the loop, each successive field name is displayed on the upper screen – this screen remains in place for the duration of the program. When the loop terminates, the program asks the user to check that all fields have been entered, and in the correct order. If the response is 'NO' the program terminates as no useful work can be done. In such a case, the user should re-start the program and enter the fields correctly, or alternatively regenerate the definition file.

Given the instruction to proceed, the program attempts to decode the database control record, and displays on screen the value for the length of the data table. This value is not really meaningful except that the actual data portion of the file is unlikely to be less than the displayed figure.

Road To Recovery

The program now gets stuck into the business of recovering data. At the top of the screen it displays running counts of the number of characters read and the number of records written. It prompts the user as follows:

a) "FIELD (FIELDNAME) OK (Y/N/R):"

This prompt is prefixed by a display of the field contents. It serves the purpose of identifying the value about to be written as the first field of a newly recovered record. 'fieldname' is the name of the field given earlier on in the program. The "first" field of a file may not be the first name entered — it will be the name of the first numeric field in the record (if any), or the first string field for a record that contains no numeric fields.

Possible responses:
'y' (default) — Accept the field
'r' — Reset the display of recovered records — switch it off if it is on, switch it on if it is off
Other — Get next string from input file

b) "DOUBTFUL COUNT (NN) — WANT TO CHECK FIELD (Y/N):"
This prompt occurs when a string field is encountered with a string length greater than *max_string*. *max_string* is an arbitrary value and is merely an attempt to trap unlikely string lengths, so violation of *max_string* is not necessarily an error. *'nn'* is the length of the doubtful field.

Possible responses:
'y' — Check the field
Other (default) — Accept the field sight unseen

c) "REJECT THIS FIELD (FIELDNAME) (N/P/Y/Q):"
The prompt is prefixed by a display of the field contents. This prompt occurs after appropriate responses to (a) or (b).

Possible responses:
'y' — Reject the field and move onto the next
'q' — Quit. Here data on file will have been exhausted and the user will be looking the control table section
'p' — reposition the file pointer (e)
Other (default) — Accept the field

d) "START NEW RECORD (Y/N):"
This prompt occurs if a field has been accepted. If the field on display is the first field of a new record — ie, the user has just skipped over some rubbish fields, then the program should be instructed to restart forming a record. If the 3.5 prompt occurred because a field which exceeded *max_string* was inspected and found good, then there is no requirement to start a new record.

Possible responses:
'y' (default) — Start a new record
Other — Continue building current record

e) "MOVE CURSOR TO RECORD START POINT AND PRESS ESC"
This prompt occurs if the response to (c) was 'p'. It is prefaced by the screen being cleared and the current undecoded input stream is shown on the top of the screen. The first character position of the current field being decoded has the cursor positioned on it. The user may use the left, right, up and down arrow keys to move the cursor to where the decoding should recommence. When that position is established the ESC key should be pressed. The program will always expect to commence a new record from that point — it will not attempt to continue building the current record.

On Display

To use this powerful feature successfully, the user must be aware of the record field structure — all numeric fields occupy 8 bytes and occur at the beginning of a record; each string field is prefixed by a 1 byte control field. If the new record starts on a string field then the cursor should be placed on the control byte. If the new record starts with a numeric field, then the user should count back nn times 8 characters from the control byte of the first record string field (where nn is the number of numeric fields in the record).

While moving the cursor over 'non-display' characters — shown on screen as square blocks — the program displays the decimal value of the character code at the bottom of the screen. This will assist in the recognition of the string controllers.

It should also be noted that a 'genuine' record has two 'spare' bytes at the end of it.

If the feature is invoked by mistake — 'p' was pressed accidentally — then ensure the cursor position is left unchanged and press ESC; the program will resume as though the current field were the first field of a new record.

f) "THE FILE DATA IS NOW PROBABLY EXHAUSTED — DO YOU WANT TO QUIT (N/Y/D):"

This message occurs when the number of characters read from the input file exceeds the control value contained in the database control record. Of course if the database is corrupted, it is just as probable (in fact it is more probable) that the control value itself is in error.

If the user suspects that the program is now beyond the data section of the file, then he can elect to quit at this point. Conversely, he may choose to continue examining the file for further records. If the message becomes a nuisance, it may be switched off.

The program will in any event detect the true end of input, and terminate automatically

Possible response:

'y' — Quit the recovery

'd' — Disable the test (stop sending the message)

Other (default) — Continue with scan and the message display

Winding Up

Once the user 'quits' recovery or the end of the data section of the corrupt database has been reached a message will display the number of records recovered, all files will then be closed and our recovery program will terminate. All that remains to be done is to load Archive and IMPORT the output file defined at the start of recovery. This 'pseudo' export file will contain all the records recovered and Archive will automatically recreate a database about them.

Should the recovery be accidentally aborted, using CTRL/SPACE, then to re-instate the screen and file statuses, the user should type 'shutdown'. This will close the input and output files and restore the standard screen configuration.

Because the 'export file' generated by our recovery program is entirely text, it may — unlike a normal database file — be easily scanned (eg, SuperBasic 'Copy filename to scr_') producing a meaningful display, or edited using a suitable text editor (eg, Metacomco's ED).

Finally, you should note the program has to decode the (rather complicated) floating point format used in the Archive database. In doing this, it tends to work to 16 significant places. Very large or very small numbers will not be converted (numbers greater than 2 ^ 56 or less than 2 ^_ 56). Some of the numeric output of the program is therefore a bit slow and probably with more significant places than Archive itself supports. This should cause no concern, as the IMPORT process will perform any necessary truncation.

```
1 REMark RECOVER - get data from busted Archive db
f
2 REMark
3 REMark Version 1.3 - Chas Dillon - Sept 85
4 CLEAR
5 rcvr$ = "RECOVER 1.3"
6 REMark
7 :
8 initialise
9 IF NOT quit : do_transfer
10 shutdown
11 :
12 DEFine PROCedure initialise
13 LOCal i,xs$
14 MODE 0:OPEN #1,con_448x200a32x16_128
15 npap = 4 : nink = 0 : hpap = 0 : hink = 7
16 PAPER npap : INK nink : CLS
17 PRINT rcvr$;" - attempt recovery of corrupted d
/b - C.D. Sept 85"
18 LET wrong =1
19 REPeat i_f_loop
20 AT 3,10 : prompt "Enter input device type (m/f)
: "
21 IF yn$=="f" : dvc$="flp" : ELSE : dvc$="mdv"
22 AT 4,10 : prompt "Enter input device no (1 - 6)
: "
23 dvc$ = dvc$ & yn$ & "_"
24 AT 5,15 : prompt "Enter name of input file: "
25 IF NOT ("_" INSTR yn$) : yn$ = yn$ & "_dbf"
26 ipfil$ = dvc$ & yn$ : LET ipdvc$ = dvc$
27 LET wrong = FOP_IN(#5,ipfil$)
28 IF NOT wrong : EXIT i_f_loop
29 AT 6,10 : PRINT "File not found"
30 END REPeat i_f_loop
31 AT 6,9 : prompt "Enter output device type (m/f)
: "
32 IF yn$=="f" : dvc$="flp" : ELSE : dvc$="mdv"
33 AT 7,9 : prompt "Enter output device no (1 - 6)
: "
34 dvc$ = dvc$ & yn$ & "_"
35 AT 8,14 : prompt "Enter name of output file: "
36 IF NOT ("_" INSTR yn$) : yn$ = yn$ & "_exp"
37 opfil$ = dvc$ & yn$
38 AT 10,0 : prompt "Do you want file output displ
ayed (y/n): "
39 IF NOT yn$=="n" : show_em = 1 : ELSE : show_em
= 0
40 check_em = 1
41 REMark AT 12,2 : prompt "Do you want first fiel
d prompts (y/n): "
42 REMark IF NOT yn$=="n" : check_em = 1 : ELSE :
check_em = 0
43 DELETE opfil$
44 OPEN_NEW #6,opfil$
45 LET q$='"' : LET cq$='"',"' : LET c$=","
46 max_string = 51 : REMark Longest 'unchecked' st
ring allowed
47 fmax = 100 : REMark maximum number of d/b field
s
48 sl = 16 : REMark string length - numeric accura
cy
49 mn = 55 : REMark mantissa length in f.p. format
50 hist_lim = 256 : REMark limit of scan-back for
reposition
51 hist$ = ""
52 new_record = 0 : quit = 0 : stack_ct = 0 : in_c
t = 0 : buffer = 0
53 recs = 0 : hist_ptr = 0
54 get_fldnames : IF quit : RETurn
55 REMark ********** d/base control rec *********
****
56 FOR i = 1 TO 10
57 xs$ = get_char$ : END FOR i : REMark throw away
 header
58 data_len = 0
59 FOR i = 1 TO 4
60 data_len = data_len * 256 + CODE(get_char$) : E
ND FOR i
61 FOR i = 1 TO 6
62 xs$ = get_char$ : END FOR i : REMark throw away
 other cntrl flds
63 PRINT "Probable data length is ";data_len;" cha
racters"
64 load_data
65 END DEFine
66 DEFine PROCedure do_transfer
67 REPeat xfr_loop
68 IF quit : EXIT xfr_loop
69 IF in_ct >= data_len
70 PRINT "The file data is now possibly exhausted"
;
71 prompt " - Do you want to quit (n/y/d): "
72 IF yn$=="y" : EXIT xfr_loop : ELSE : IF yn$=="d
" : data_len=9.999999E6
73 END IF
74 LET fct = 1 : REMark field number for error mes
sages
75 LET bad = 0
76 REPeat field_loop
77 IF fct > fldct : EXIT field_loop
78 IF quit : EXIT field_loop
79 para = 0 : bad = 0 : new_record = 0
80 IF fct = 1 AND check_em : para = 2
81 LET ptr = rel_pos(fct)
82 IF fct > numfld
83 x$(ptr) = get_str$(para)
84 ELSE
85 x$(ptr) = get_num$(para) : END IF
86 IF NOT bad
87 fct = fct + 1
88 ELSE
89 IF new_record
90 fct = 2
91 IF ptr <= numfld OR NOT numfld
92 x$(rel_pos(1)) = x$(ptr) : ELSE
93 IF LEN(x$(ptr)) < 3
94 x$(rel_pos(1)) = "0" : ELSE
95 x$(rel_pos(1)) = x$(ptr)(2 TO LEN(x$(ptr))-1)
96 END IF : END IF
97 ELSE : fct = 1 : END IF
98 END IF
99 END REPeat field_loop
100 xs$ = get_char$ & get_char$ : REMark Tag at en
d of record
101 IF quit : EXIT xfr_loop
102 bld_string
103 IF show_em : INK 0 : PRINT xout$ : INK 7
104 PRINT #6,xout$ : recs = recs + 1 : AT #4,0,0 :
 PRINT #4,recs;
105 END REPeat xfr_loop
106 END DEFine
107 DEFine PROCedure shutdown
108 CLOSE #5
109 CLOSE #6
110 PRINT \"End of run - ";recs;" records copied"
111 WINDOW 448,200,32,16 : PAPER 4 : INK 0
112 IF NOT quit : CLOSE #4 : CLOSE #7
113 END DEFine
114 DEFine FuNction get_str$(chk_fst)
115 LOCal a$,ct
116 IF NOT quit : ct = CODE(get_char$) : ELSE : ct
 = 0
117 bad = 0 : new_record = 0
118 IF ct > max_string
119 prompt ("Doubtful count "&ct&" - want to check
 field (y/n): ")
120 IF NOT yn$=="n": bad = 1
121 END IF
122 get_text
123 check_out
124 RETurn q$ & a$ & q$
125 END DEFine
126 DEFine FuNction get_num$(chk_fst)
127 LOCal a$,ct,expon,integ$,fract$,minus$
128 decode_float
129 check_out
130 RETurn a$
131 END DEFine
132 DEFine PROCedure get_text
133 LOCal j
134 a$ = ""
135 j = 0
136 REPeat char_loop
137 IF quit : EXIT char_loop
138 IF NOT j < ct : EXIT char_loop
139 j = j + 1
140 a$ = a$ & get_char$
141 END REPeat char_loop
142 IF fct > numfld
143 LET hist_ptr = LEN(a$) + 1
```

```
144 ELSE
145 LET hist_ptr = 8 : END IF
146 END DEFine
147 DEFine FuNction get_char$
148 AT #7,0,0 : PRINT #7,in_ct;
149 IF buffer
150 xs$ = hist$(buffer)
151 buffer = buffer + 1 : in_ct = in_ct + 1
152 IF buffer > LEN(hist$) : buffer = 0 : hist$ =
""
153 RETurn xs$ : END IF
154 IF EOF(#5) : quit = 1 : RETurn ""
155 in_ct = in_ct + 1
156 xs$ = INKEY$(#5,-1)
157 RETurn xs$
158 END DEFine
159 DEFine PROCedure check_out
160 field$ = f_name$(rel_pos(fct))
161 IF chk_fst
162 PRINT q$; a$; q$;"          "; : IF LEN(a$) >
40 : PRINT
163 prompt ("Field " & field$ & " ok (y/n/r): ")
164 IF yn$=="n" :  bad=1 : ELSE : IF yn$=="r" : sh
ow_em = ABS(show_em-1)
165 END IF
166 REPeat bad_loop
167 IF NOT bad : EXIT bad_loop
168 IF quit : bad = 0 : new_record = 1 : EXIT bad_
loop
169 IF bad = 1 AND LEN(a$)
170 PRINT q$; a$; q$
171 INPUT ("Reject this field(" & field$ & ") (n/p
/y/q): ");yn$;
172 ELSE : yn$ = "y" : END IF
173 IF yn$=="y"
174 LET bad = 1 : PRINT
175 ELSE
176 IF yn$=="q"
177 LET bad = 0 : LET new_record = 1 : LET quit =
1
178 ELSE
179 IF yn$=="p"
180 re_position
181 ELSE
182 LET bad = 0 : prompt "    Start new record (y/
n): "
183 IF NOT yn$=="n" : LET new_record = 1
184 END IF : END IF : END IF
185 IF NOT bad : EXIT bad_loop
186 IF fct <= numfld
187 decode_float
188 ELSE
189 REPeat scan
190 IF NOT quit : ct = CODE(get_char$) : ELSE : ct
 = 0
191 IF NOT ct > max_string : EXIT scan
192 END REPeat scan
193 get_text
194 END IF
195 END REPeat bad_loop
196 bad = bad + new_record
197 END DEFine
198 DEFine PROCedure re_position
199 LOCal x
200 CLS
201 IF NOT buffer
202 x = in_ct - hist_lim - 1
203 IF x<0 : x = 0
204 BGET #5\x : y = x
205 REPeat scan_back
206 x = x + 1 : IF x > in_ct : EXIT scan_back
207 hist$ = hist$ & INKEY$(#5,-1)
208 END REPeat scan_back
209 END IF
210 FOR col = 1 TO LEN(hist$) : h_off : END FOR co
l
211 PRINT \\"Move cursor to record start point and
 press ESC"
212 IF buffer
213 col = buffer - hist_ptr + 1 : in_ct = in_ct -
hist_ptr : ELSE
214 in_ct = in_ct - hist_lim - 1 : IF in_ct < 0 :
in_ct = 0
215 col = LEN(hist$) - hist_ptr + 1 : in_ct = in_c
t + col : END IF
216 h_on : buffer = 0
217 REPeat esc_loop
218 x = CODE(INKEY$(-1))
219 SELect ON x
220 = 192 TO 199 : IF col-1 : h_off : col=col-1:in
_ct=in_ct-1: h_on
221 = 200 TO 207 : IF col >= LEN(hist$)
222 in_ct=in_ct-1
223 hist$ = hist$ & get_char$ : END IF
224 IF col < LEN(hist$)
225 h_off : col=col+1:in_ct=in_ct+1 : h_on : END I
F
226 = 208 TO 215 : IF col-74>0:h_off:col=col-74:in
_ct=in_ct-74:h_on
227 = 216 TO 223 : IF col+74<LEN(hist$)
228 h_off :col=col+74:in_ct=in_ct+74:h_on:END IF
229 = 27 : EXIT esc_loop
230 END SELect
231 END REPeat esc_loop
232 buffer = col
233 bad = 1 : new_record = 1 : fct = 1 : REMark fo
rce restart of record
234 field$ = f_name$(rel_pos(fct))
235 AT linmax-2,0
236 PAPER 2 : INK 7 : CLS 2 : CLS 3
237 END DEFine
238 DEFine PROCedure h_on
239 LOCal x
240 PAPER 4 : INK 0
241 x = CODE(hist$(col))
242 AT linmax,10
243 IF NOT (x>31 AND x<128)
244 PRINT x;"   " : ELSE : PRINT "       " : END I
F
245 AT (col-1) DIV 74,(col-1) MOD 74 : PRINT hist$
(col);
246 END DEFine
247 DEFine PROCedure h_off
248 PAPER 2 : INK 7
249 AT (col-1) DIV 74, (col-1) MOD 74 : PRINT hist
$(col);
250 END DEFine
251 DEFine PROCedure decode_float
252 LET ct = 8
253 get_text
254 get_bit_str
255 IF bit(1) : LET minus$="-" : ELSE : LET minus$
=""
256 expon = 0
257 FOR j = 2 TO 9
258 expon = expon + (2^(9-j) * bit(j)) : END FOR j
259 expon = expon - 128
260 IF (expon - 1) >= mn
261 do_big_numb
262 ELSE
263 IF expon > 0
264 stack_nos 1,expon,mn : ELSE
265 stack_nos 1,expon+1,mn
266 END IF
267 fract$ = added_stack$
268 IF expon < 1
269 integ$ = "" : ELSE
270 set_stack expon,int_tab$
271 IF expon-1 : stack_nos -1,expon-1,1
272 integ$ = added_stack$
273 END IF
274 END IF
275 IF LEN(fract$)
276 IF LEN(integ$)
277 a$ = minus$ & shrunk_str$(integ$ & "." & fract
$)
278 ELSE
279 a$ = minus$ & "0" & shrunk_str$("." & fract$)
280 END IF
281 ELSE
282 IF LEN(integ$)
283 a$ = minus$ & shrunk_str$(integ$ & " ")
284 ELSE
285 a$ = "0"
286 END IF
287 END IF
288 END DEFine
289 DEFine FuNction shrunk_str$ (text$)
290 REPeat front
291 IF text$(1) = "0"
292 IF text$ = "0" : text$ = "" : EXIT front
293 text$ = text$(2 TO) : ELSE : EXIT front : END
IF
294 END REPeat front
295 IF LEN(text$)
296 REPeat back
297 IF text$(LEN(text$)) = "0"
298 text$ = text$(1 TO LEN(text$)-1)
299 ELSE : EXIT back : END IF
300 END REPeat back
301 END IF
302 RETurn text$
303 END DEFine
304 DEFine FuNction added_stack$
305 LOCal carry,numb,ans$
306 IF NOT stack_ct : RETurn ""
307 LET carry = 0 : ans$ = FILL$("0",sl)
308 FOR i = sl TO 1 STEP -1
309 numb = carry
310 FOR j = 1 TO stack_ct
311 numb = numb + stack$(j,i) : END FOR j
312 ans$(i) = numb MOD 10
313 carry = numb DIV 10 : END FOR i
314 stack_ct = 0
315 RETurn ans$
316 END DEFine
317 DEFine PROCedure set_stack (pointer,array$)
318 stack_ct = stack_ct + 1
319 stack$(stack_ct) = array$(pointer)
320 END DEFine
321 DEFine PROCedure stack_nos (adder,begin,finish
)
322 LOCal i,j,start
323 IF begin < 1
324 j = ABS(begin)+1 : start = 1
325 ELSE
326 j = 0 : start = begin : END IF
327 IF adder>0
328 i = start
329 REPeat frac_loop
330 IF i > mhigh : EXIT frac_loop
331 j = j + 1 : IF j > mn : EXIT frac_loop
332 IF mant(i) : set_stack j, frac_tab$
333 i = i + adder
334 END REPeat frac_loop
335 ELSE
336 FOR i = start TO finish STEP adder
337 j = j + 1
338 IF mant(i) : set_stack j, int_tab$
339 END FOR i
340 END IF
341 END DEFine
342 DEFine PROCedure do_big_numb
343 PRINT "Problems - no big number routine"
344 integ$ = "" : fract$ = "" : bad = 1
345 END DEFine
346 DEFine PROCedure get_bit_str
347 LOCal i,j,k
348 mhigh = 0
349 FOR k = 1 TO 9
350 j = (k-1) MOD 8 : i = ((k-1) DIV 8) + 1
351 IF CODE(a$(i)) && 2^(7-j) : bit(k) = 1 : ELSE
: bit(k) = 0
352 END FOR k
353 FOR k = 1 TO mn
354 j = k MOD 8 : i = (k DIV 8) + 2
```

```
355 IF CODE(a$(i)) && 2^(7-j)
356 LET mhigh = k : mant(k) = 1 : ELSE : mant(k) =
 0
357 END IF
358 END FOR k
359 END DEFine
360 DEFine PROCedure get_fldnames
361 LOCal lin,col,strct
362 DIM f_type(fmax),rel_pos(fmax),f_name$(fmax,13
),x$(fmax,255)
363 CLS
364 fldct=0 : fct = 0 : numfld = 0 : file_ip = 0
365 PRINT rcvr$;" - Database Field names - Enter i
n CORRECT order"
366 LET wrong =1
367 REPeat s_f_loop
368 AT 10,10:prompt "Fieldnames from the keyboard
or a file (k/f): "
369 IF yn$=="f"
370 AT 12,4 : prompt "Enter device/file name conta
ining field names: "
371 IF NOT ("_" INSTR yn$) : yn$ = ipdvc$ & yn$
372 wrong = FOP_IN(#7,yn$) : LET file_ip = 1
373 ELSE
374 LET file_ip = 0 : LET wrong = 0 : END IF
375 IF NOT wrong : EXIT s_f_loop
376 AT 14,10 : PRINT "File not found"
377 END REPeat s_f_loop
378 AT 3,0 : CLS 2
379 REPeat name_loop
380 IF file_ip
381 IF EOF(#7) : EXIT name_loop
382 INPUT #7,yn$
383 IF yn$(1 TO 5)=="proc " :  NEXT name_loop
384 IF yn$(1 TO 7)=="create " : NEXT name_loop
385 IF yn$(1 TO 9)=="endcreate" : EXIT name_loop
386 IF yn$(LEN(yn$))=CHR$(13)
387 yn$ = yn$(1 TO LEN(yn$)-1) : END IF
388 ELSE
389 AT 18,10 : CLS 3 : prompt "Enter the name of t
he field: "
390 END IF
391 AT 19,0 : CLS 3
392 IF NOT LEN(yn$) : EXIT name_loop
393 IF LEN(yn$) > 13
394 AT 19,10 : PRINT yn$;" - Name too long" : NEXT
 name_loop
395 END IF
396 IF fldct = fmax
397 fldct = 0 : PRINT "Too many fields - amend fma
x control"
398 EXIT name_loop : END IF
399 fldct = fldct + 1
400 IF yn$(LEN(yn$)) = "$"
401 f_name$(fldct)=yn$
402 f_type(fldct) = 1
403 ELSE
404 numfld = numfld +1
405 rel_pos(numfld) = fldct
406 f_name$(fldct)=yn$
407 f_type(fldct) = 0
408 END IF
409 LET lin = (fldct-1) DIV 5 : LET col = (fldct-1
) MOD 5
410 AT lin+2,col*15 : PRINT yn$
411 IF fldct-1 : PRINT #6,c$;q$;yn$;q$; : ELSE : P
RINT #6,q$;yn$;q$;
412 END REPeat name_loop
413 PRINT #6
414 IF file_ip : CLOSE #7
415 REPeat force_ans
416 AT 18,10 : CLS 3 : prompt "Are these correct (
y/n): "
417 IF yn$=="y" OR yn$=="n" : EXIT force_ans
418 END REPeat force_ans
419 IF NOT fldct : yn$ = "n"
420 IF yn$=="n" : quit = 1 : RETurn
421 AT 0,0 : PRINT rcvr$;" - Translation Diagnosti
cs - contents in order of names"
422 AT 1,0: PRINT "Characters read:": AT 1,51 : PR
INT "Records copied:"
423 OPEN #4,scr_36x10a444x26 : PAPER #4,npap : INK
 #4,nink
424 OPEN #7,scr_36x10a134x26 : PAPER #7,npap : INK
 #7,nink
425 osl = 10 * (lin+3)
426 linmax = 19 - (lin+3)
427 WINDOW 448,200-osl,32,16+osl
428 npap = 2 : nink = 7 : hpap = 0 : hink = 7
429 PAPER npap : INK nink : CLS
430 fct = 0 : strct = 0
431 REPeat posn_loop
432 fct = fct + 1
433 IF fct > fldct : EXIT posn_loop
434 IF f_type(fct)
435 strct = strct + 1
436 rel_pos(numfld+strct) = fct
437 END IF
438 END REPeat posn_loop
439 END DEFine
440 DEFine PROCedure bld_string
441 LET fct = 0
442 LET xout$ = ""
443 REPeat str_loop
444 LET fct = fct + 1
445 IF fct > fldct : EXIT str_loop
446 IF fct = 1
447 xout$ = x$(fct)
448 ELSE
449 xout$ = xout$ & "," & x$(fct)
450 END IF
451 END REPeat str_loop
452 END DEFine
453 DEFine PROCedure prompt (text$)
454 REPeat drain : LET yn$=INKEY$ : IF NOT LEN(yn$
) : EXIT drain
455 END REPeat drain
456 PRINT text$; : PAPER hpap : INK hink : INPUT y
n$
457 PAPER npap : INK nink
458 END DEFine
459 DEFine PROCedure load_data
460 DIM int_tab$(mn,sl),frac_tab$(mn,sl),stack$(mn
,sl),bit(9),mant(mn)
461 RESTORE
462 READ int_count
463 FOR i = 1 TO int_count
464 READ int_tab$(i) : END FOR i
465 READ frac_count
466 FOR i = 1 TO frac_count
467 READ frac_tab$(i) : END FOR i
468 END DEFine
```

```
469 DATA 55
470 DATA "0000000000000001"
471 DATA "0000000000000002"
472 DATA "0000000000000004"
473 DATA "0000000000000008"
474 DATA "0000000000000016"
475 DATA "0000000000000032"
476 DATA "0000000000000064"
477 DATA "0000000000000128"
478 DATA "0000000000000256"
479 DATA "0000000000000512"
480 DATA "0000000000001024"
481 DATA "0000000000002048"
482 DATA "0000000000004096"
483 DATA "0000000000008192"
484 DATA "0000000000016384"
485 DATA "0000000000032768"
486 DATA "0000000000065536"
487 DATA "0000000000131072"
488 DATA "0000000000262144"
489 DATA "0000000000524288"
490 DATA "0000000001048576"
491 DATA "0000000002097152"
492 DATA "0000000004194304"
493 DATA "0000000008388608"
494 DATA "0000000016777216"
495 DATA "0000000033554432"
496 DATA "0000000067108864"
497 DATA "0000000134217728"
498 DATA "0000000268435456"
499 DATA "0000000536870912"
500 DATA "0000001073741824"
501 DATA "0000002147483648"
502 DATA "0000004294967296"
503 DATA "0000008589934592"
504 DATA "0000017179869184"
505 DATA "0000034359738368"
506 DATA "0000068719476736"
507 DATA "0000137438953472"
508 DATA "0000274877906944"
509 DATA "0000549755813888"
510 DATA "0001099511627776"
511 DATA "0002199023255552"
512 DATA "0004398046511104"
513 DATA "0008796093022208"
514 DATA "0017592186044416"
515 DATA "0035184372088832"
516 DATA "0070368744177664"
517 DATA "0140737488355328"
518 DATA "0281474976710656"
519 DATA "0562949953421312"
520 DATA "1125899906842624"
521 DATA "2251799813685248"
522 DATA "4503599627370496"
523 DATA "9007199254740992"
524 DATA "9999999999999999"
525 REMark
526 DATA 55
527 DATA "5000000000000000"
528 DATA "2500000000000000"
529 DATA "1250000000000000"
530 DATA "0625000000000000"
531 DATA "0312500000000000"
532 DATA "0156250000000000"
533 DATA "0078125000000000"
534 DATA "0039062500000000"
535 DATA "0019531250000000"
536 DATA "0009765625000000"
537 DATA "0004882812500000"
538 DATA "0002441406250000"
539 DATA "0001220703125000"
540 DATA "0000610351562500"
541 DATA "0000305175781250"
542 DATA "0000152587890625"
543 DATA "0000076293945313"
544 DATA "0000038146972656"
545 DATA "0000019073486328"
546 DATA "0000009536743164"
547 DATA "0000004768371582"
548 DATA "0000002384185791"
549 DATA "0000001192092891"
550 DATA "0000000596046446"
551 DATA "0000000298023223"
552 DATA "0000000149011612"
553 DATA "0000000074505806"
554 DATA "0000000037252903"
555 DATA "0000000018626451"
556 DATA "0000000009313226"
557 DATA "0000000004656613"
558 DATA "0000000002328306"
559 DATA "0000000001164153"
560 DATA "0000000000582077"
561 DATA "0000000000291038"
562 DATA "0000000000145519"
563 DATA "0000000000072760"
564 DATA "0000000000036380"
565 DATA "0000000000018190"
566 DATA "0000000000009095"
567 DATA "0000000000004547"
568 DATA "0000000000002274"
569 DATA "0000000000001137"
570 DATA "0000000000000568"
571 DATA "0000000000000284"
572 DATA "0000000000000142"
573 DATA "0000000000000071"
574 DATA "0000000000000036"
575 DATA "0000000000000018"
576 DATA "0000000000000009"
577 DATA "0000000000000004"
578 DATA "0000000000000002"
579 DATA "0000000000000001"
580 DATA "0000000000000000"
581 DATA "0000000000000000"
```

PRINTERLAND

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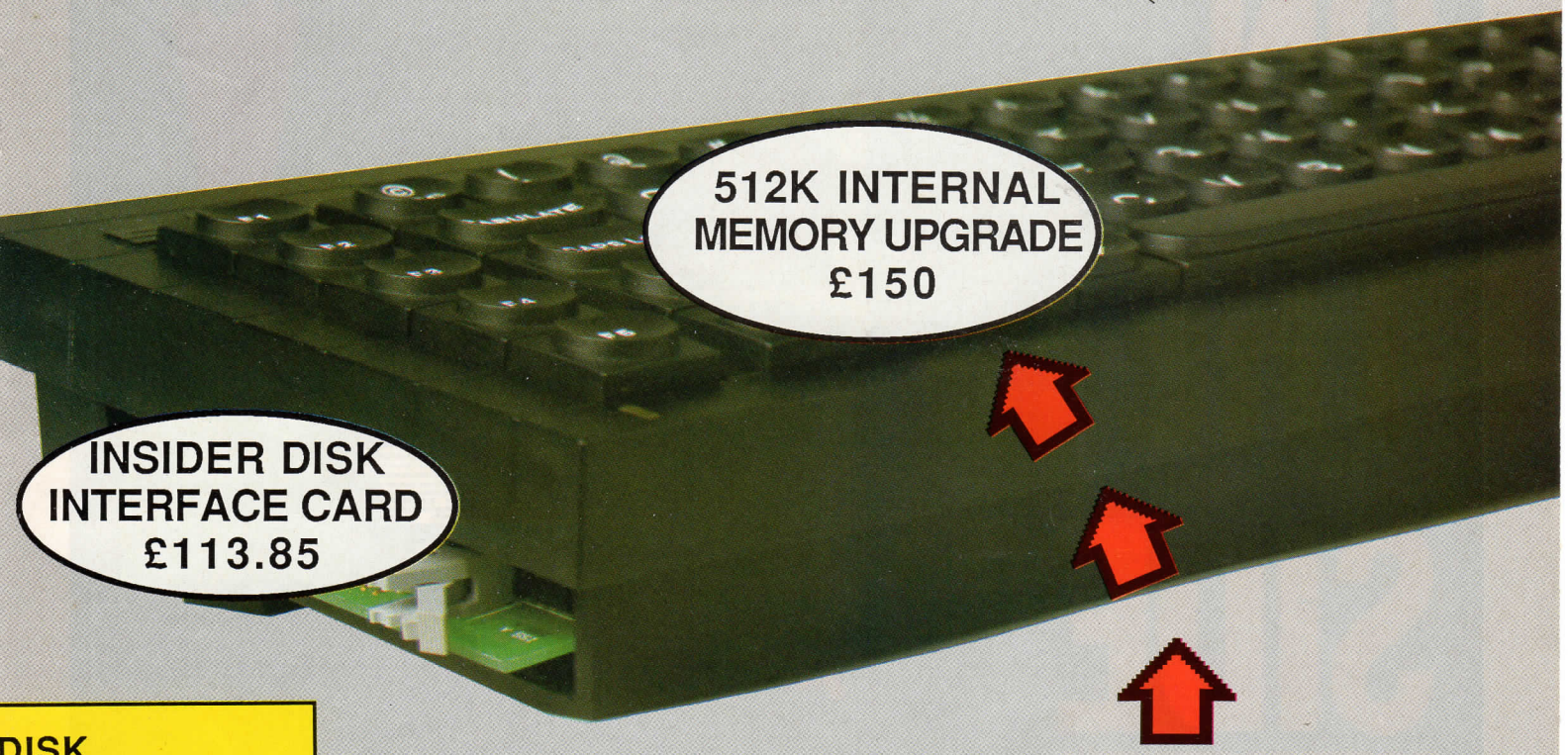

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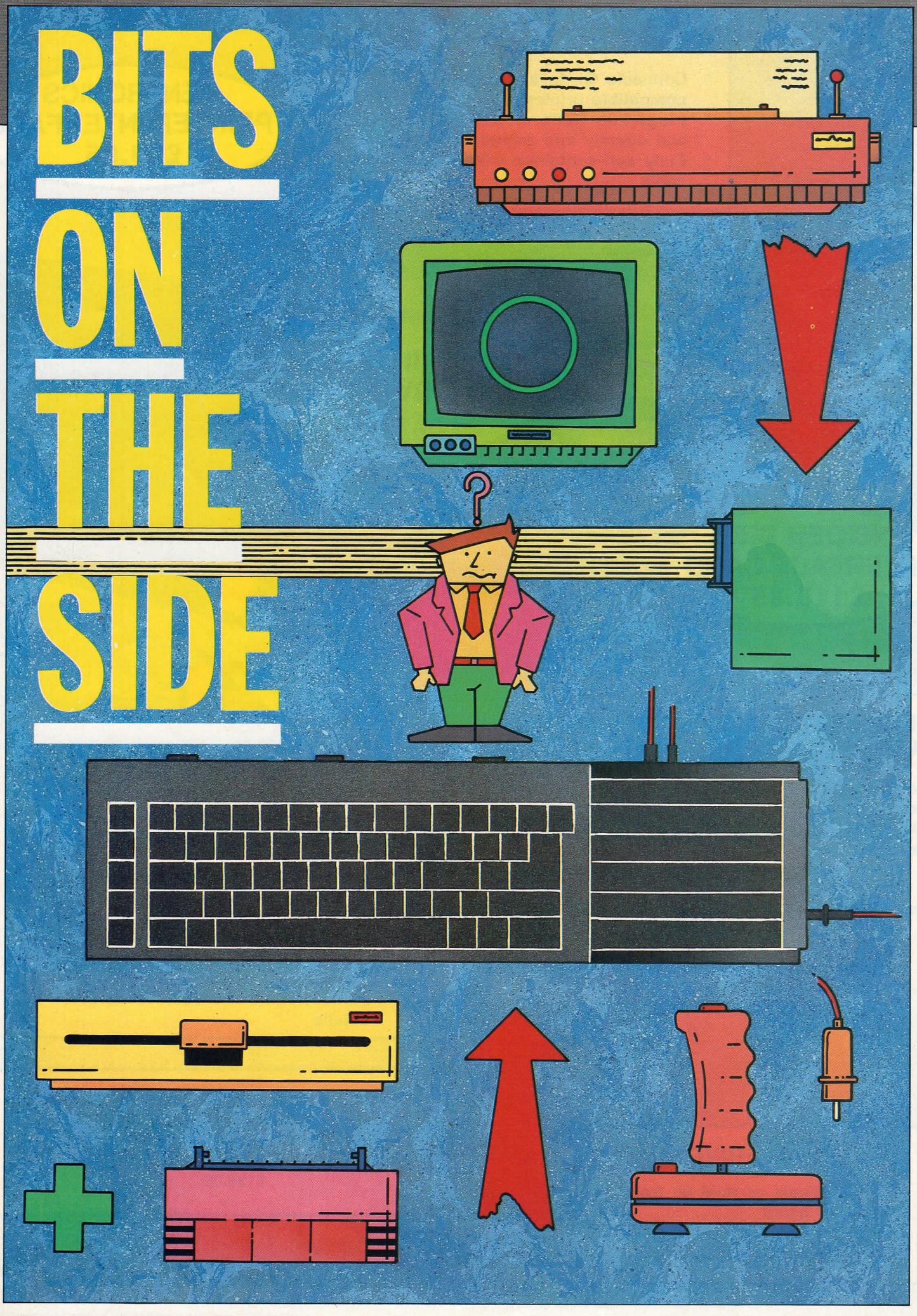

A new feature series devoted to QL peripherals.
This month we begin with printer interfaces and monitors.

A line Computer Systems

Address:
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Telephone:
0533 778724
Product:
Super Spooler
Type:
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Description:
Internally fitted Epson Serial Interface with up to 64K buffered memory.
Connections:
QL-Serial Port
Baud Rates:
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Address:
Unit 14, Peerglow Industrial Est, Old Approach, Tolpits Lane, Watford, Herts
Telephone:
0923 777155
Product:
Serial to Parallel Convertor
Type:
Switchable Printer Interface
Description:
Simple Plug-in-and-go junction box type interface incorporating switch to vary Baud rates.
Baud Rates:
75, 300, 600, 1200,2400,4800, 9600
Connections:
QL-Serial port, Printer-Centronics

Compuser

Address:
King Herny's Drive, New Addington, Croydon, Surrey
Telephone:
0689 46116
Product:
Series 700 Monitor
Type:
14" Medium Resolution Colour Monitor
Description:
Heavy duty colour monitor.
Dot Width:
0.42mm
Resolution:
650 x 440
Bandwidth:
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Signal:
RGB
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CST

Address:
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Telephone:
0438 352150
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Q-PI
Type:
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Description:
Adds a Centronics type parallel port to the based printer driver with facility to memory as a buffer.
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QL-Main I/O port (64way), Printer-Centronics
Price:
£50.00

Product:
Q-488
Type:
IEEE-488 Interface
Description:
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Connection:
QL-Main I/O port
Price:
£227.00

DDL

Address:
5 King's Ride Park, Ascot, Berks SL5 8BP
Telephone:
0990 28921
Product:
Vision QL monitor
Type:
RGB monitor (12"
Description:
Sinclair 'badged' colour monitor with controls at the front.
Price:
Contact dealers.

Miracle Systems

Address:
Avondale Workshops, Woodland Way, Kingswood, Bristol
Telephone:
0272 603871
Product:
Centronics Interface
Type:
Serial to parallel
Description:
Plug-in-and-go junction box type printer interface
Baud Rate:
9600
Connection:
QL-Serial port, Printer-Centronics
Price:
£29.95

Opus Supplies

Address:
158 Camberwell Rd, London SE5
Telephone:
01 701 8668
Product:
JVC Colour Monitor (Electrohome Hi-res Display)
Type:
14" Medium Resolution Colour Monitor
Dot Width:
0.41mm
Resolution:
580 x 470
Bandwidth:
10MHz
Signal:
RGB

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Address:
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Telephone:
0533 374917
Product:
Microvitec CUB 653
Type:
14" Medium Resolution Colour Monitor
Dot Width:
0.43mm
Resolution:
653 x 585
Bandwidth:
18MHz
Signal:
RGB
Product:
Centronics printer interface
Type:
Serial to parallel
Description:
Plugs into SER1 or SER2. Comes with 3m cable.
Price:
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OF DISKS

Colin Opie presents a two part in depth exposé of disk and microdrive storage.

It has happened to us all at some time. Everything is going smoothly, we've just reached the last line of a 10,000 word masterpiece, carefully saving and overwriting every ten minutes or so and then . . . Tragedy! 'Bad or changed Medium' raises its ugly head. At this point it is immaterial whether we own a shiny new disk drive until, or are still perservering with the Microdrives, the cold sweat still appears as panic sets in. 'Where is our program?' we ask, 'Surely there must be a way of getting it back? Oh please, please, there must be!' Next comes the realisation of the full horror of it all – we've got to start all over again (groan).

If this scenario is alien to you at the moment, then watch out, you're probably well overdue for some similar calamity to occur. However, there is an answer other than sending your QL to instant oblivion with a single blow – sector editing and rebuilding. And that's where this two part series comes in. It's been designed to lead you into the intricacies of file storage formats on both microdrives and disks.

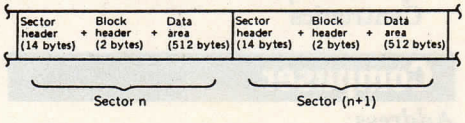
In the first part we look at the theory of how microdrives are formatted, and how files are saved on them. Three machine code extensions to SuperBasic are supplied that will help you to experiment with, patch or save microdrive sectors. Two of them enable reading and writing microdrive sectors directly to and from a single dimension string array. These routines are adapted from a much larger library of utilities and programs for supporting Microdrive and disk media operations. The full suite is marketed (as a complete package) by Digital Precision, and the two adapted routines are included here (with permission).

The third is a simple display routine that will print a given number in hexadecimal format. This was originally developed for the book *QL Assembly Language Programming*. Some of the technical parts of the text are taken from *QL Interfacing and Hardware;* both books being published by McGraw-Hill (again extracts are included with permission). Finally, we look at a few examples and utility programs related to the recovery of deleted files and files on a corrupted microdrive cartridge.

ILLUSTRATION BY ROY INGRAM

Microdrive Format

The microdrive cartridge storage format is extremely uniform and compact. Although the optimum can never be achieved, due to tape splicing and so on, a tape 'FORMAT' operation will create a numbered sequence of good sectors up to a maximum of 256 (see *Figure 1*). Looking at



things a little simplistically, each sector can be thought of as containing three blocks of information:

1. A Sector header

The sector header for each sector is recorded once (at FORMAT time), and once only. It is fourteen bytes long and contains the following data:

$00 Code $FF (Identifier byte)
$01 Sector number (0-255)
$02 Ten byte medium title (specified at FORMAT time)
$0C 16-bit random number

This header is used by QDOS in order to determine if the medium in the drive has been changed. As the data exists at the head of every good sector, the check can be very quick.

AND DRIVES

2. A block header
The block header for a sector is written each time a data write operation is performed on that sector. It is two bytes long and contains the 'File number' (0-255) and the 'Block number' (0-255) associated with the data stored in the sector. As an aside, the QDOS routines that enable us to read and write sector data also manipulate the block header data. Data and block headers are inseparable in this respect.

3. A data area
Each sector created on a tape cartridge is capable of storing 512 bytes of data. When reading a sector of data the appropriate QDOS routine will also return the file and block number associated with that sector. Conversely, when writing a sector of data the appropriate QDOS routine needs to know what file and block number are to be associated with that data.

There are three main ways in which the data in a sector is organised, depending on whether the sector in question is the 'mapping' sector, a sector containing directory data, or just a simple data sector. Files are also stored with their own header data that is related to the corresponding directory entry. These structures are vital to our 'inside' handling of the tapes, so we will look at these next.

Any file that is to be stored on a tape must be stored in physical sectors. So, the system splits the file into 512 byte blocks and writes each block, or part block in the case of the last one, into a free sector. Each file saved is given a number that is used as an index into the directory. Initially, saved files are allocated numbers from unity upwards (ie, 1, 2, 3, . . .). If three sectors are required to be saved (for example, file number six), at the end of the operation there would be three sectors with block headers of <6,0> <6,1> and <6,2>.

The directory of a cartridge is handled by QDOS in the same way as a user file. The only difference is that, normally, only QDOS has access to this file.

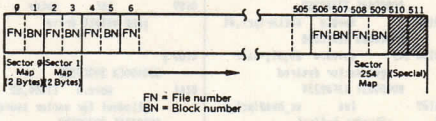
All files are stored with a 64 byte header that contains essential pertinent data about that file:

$00 32-bit integer holding file length (bytes). The file length includes the header.
$04 File access key byte.
$05 File type byte.
$06 File information (8 bytes).
$0E 16-bit integer holding file name length.
$10 File name (ASCII). Max 36 bytes.
$34– (Reserved).

The file access byte is normally set to zero. The file type code is zero for data files or SuperBasic programs, or unity for executable programs. In this latter case the first four bytes of the file information field contain the default size of the data space for that program. Note that the existence of this header means that only 440 bytes of the actual file can be stored in the first sector block (block 0). Any subsequent blocks can contain a full 512 bytes.

The Mapping Sector

Sector zero is special, and is called



the 'mapping' sector. It maps logical file storage onto physical sectors. Sector zero is split up into 256 two byte entries. The first two bytes contain the file and block number of sector zero (see *Figure 2*). The next two bytes contain the file and block number of sector 1, and so on. Because there can never be 256 good sectors, the last two bytes of sector zero are used by the system for other purposes. In practice we need not concern ourselves with these last few bytes. We already know that user files are saved with numbers rang-

LISTING 4

```
    Microdrive Sector Handlers
McGraw-Hill(UK) 68000 Assembler v2.0
0001 ;h Microdrive Sector Handlers

0002 ;

0003 ; a) SuperBASIC extensions to r
ead/write Microdrive

0004 ; sectors:

0005 ;

0006 ;   GET_MSEC d%,s%,buff  - rea
d sector 's', drive 'd', into buffer

0007 ;   PUT_MSEC d%,s%,buff  - wri
te sector 's', drive 'd', from buffe
r

0008 ;

0009 ; In both cases, 's%' and 'd%'
are integers and 'buff$' is a

0010 ; 514 byte array. 'd%' may be
1 or 2. 's%' may range from 0

0011 ; to 255. Last 2 bytes of array
 hold the data for the 'block'

0012 ; and 'file' numbers for a sect
or.  These are returned on a

0013 ; sector read, and used for the
 sector header on writes.

0014 ;

0015 ; b) Also included in this pack
 to speed up printing of hexadecimal

0016 ; numbers:

0017 ;

0018 ;   c$ = NHEX$(n,value)  - retu
rn 'n' digit hex string for 'value'

0019 ;

0020 ; Note that this is not needed
for Microdrive operations. It is

0021 ; simply an extension to help i
n displaying results.

0022 ;

0023 ; Copyright (c) 1985 Vida Rebus

0026 ;h Constants

0027 ;

0028 ; General

0029 ;
FFFFFFFC  =
0030 err_or     = -4
FFFFFFFA  =
0031 err_no     = -6
FFFFFFF1  =
0032 err_bp     = -15
00000000  =
0033 at_inf     = 0
0000000E  =
0034 sd_cure    = $E
0000000F  =
0035 sd_curs    = $F
00000013  =
0036 at_rclk    = $13
00000028  =
0037 bv_vvbas   = $28
00000035  =
0038 sv_pcint   = $35
0000005B  =
0039 bv_rip     = $5B
000000FE  =
0040 cn_itohl   = $FE
00000110  =

0041 bp_init    = $110
00000112  =
0042 ca_gtint   = $112
00000118  =
0043 ca_gtlin   = $118
00000124  =
0044 ad_read    = $124
00000126  =
0045 ad_write   = $126
0000012A  =
0046 ad_sectr   = $12A
0049 ; Specific to microdrive operat
ions

0050 ;
00000001  =
0051 pc_sclk    = 1         ;microd
rive select clock bit
00000002  =
0052 pc_desel   = 2         ;de-sel
ect bit
00000003  =
0053 pc_selec   = 3         ;select
 bt
00000004  =
0054 pc_serb    = 4         ;0 = se
rial I/O
0000208B  =
0055 serdly     = 8331      ;RS232
serial mode delay
00000080  =
0056 pc_maskt   = $80       ;transm
it mask
000000A0  =
0057 sv_tmode   = $A0       ;transm
it mode byte
000000A6  =
0058 sv_timo    = $A6       ;timeou
t for transmit mode switching
000000E7  =
0059 pc_notmd   = $E7       ;all bi
ts mask except mode control
000000EE  =
0060 sv_mdrun   = $EE       ;microd
rive running flag

0061 ;
FFFFFFE2  =
0062 pc_tctrl   = -$1E      ;transm
it control offset from
00018020  =
0063 ad_ctrl    = $18020    ;microd
rive control register
0066 ;h Initialization

0067 ;

0068 ;
00000000
0069          org 0

0070 ;

0071 ;
00000000 43FA000C
0072 sectrw:  lea     prc_def(pc),a
1       ;link in extensions
00000004 34780110
0073          move.w  bp_init,a2
00000008 4E92
0074          jsr     (a2)
0000000A 7000
0075 no_err:  moveq   £0,d0
        ;no errors
0000000C 4E75
0076          rts

0077 ;
0000000E 0003
0078 prc_def: defw    3
        ;(2 really, but ensure space
)
00000010 0026
0079 1%:      defw    getsec-1%
00000012 084745545F4D534543
0080          defb    8,'GET_MSEC'

0081          align
0000001C 009C
0082 2%:      defw    putsec-2%
```

```
0000001E 0B5053545F4D534543
0083            defb    8,'PUT_MSEC'

0084            align
00000028 0000
0085            defw    0
                ;(procend)
0000002A 0001
0086            defw    1
                ;1 function
0000002C 00F2
0087 10I:       defw    nhex-10I
0000002E 054E48455B24
0088            defb    5,'NHEI$'

0089            align
00000034 0000
0090            defw    0
                ;(fnend)
0093 *h GET_MSEC procedure

0094 ;

0095 ; Get a microdrive sector and r
eturn it to calling code.

0096 ; A sector is 512 bytes long.

0097 ;
00000036 610001CC
0098 getsec:    bsr     arget
                ;check parameters
0000003A 6702
0099            beq.s   1I
0000003C 4E75
0100            rts
                ;bad - leave with error

0101 ;
0000003E 4E40
0102 1I:        trap    #0
                ;enter supervisor mode
00000040 48E70042
0103            movem.l a1,a6,-(a7)
                ;save SuperBASIC pointers
00000044 6100012A
0104            bsr     setdv
                ;and select the drive

0105 ;
00000048 303C03E8
0106            move.w  #1000,d0
                ;timeout for sector search
0000004C 323A0252
0107            move.w  sector(pc),d1
00000050 48A7C000
0108 2I:        movem.w d0,d1,-(a7)
                ;get sector desired
00000054 43FA0234
0109            lea     sc_head(pc),a
1               ;(header buffer)
00000058 347B012A
0110 3I:        move.w  #d_sectr,a2
                ;read next real one
0000005C 4EAA4000
0111            jsr     $4000(a2)
00000060 600E
0112            bra.s   20I
                ;bad medium
00000062 60F4
0113            bra.s   3I
                ;not a sector header
00000064 4C9F0003
0114            movem.w (a7)+,d0,d1
                ;okay...
00000068 BE01
0115            cmp.b   d1,d7
0000006A 57C8FFE4
0116            dbeq    d0,2I
0000006E 6008
0117            bra.s   readd

0118 ;
00000070 4C9F0003
0119 20I:       movem.w (a7)+,d0,d1
                ;settle stack
00000074 6000002C
0120            bra     errrw
                ;return error!

0121 ;
00000078 227A0228
0122 readd:     move.l  bufptr(pc),a1
                ;get buffer pointer
0000007C 347B0124
0123            move.w  #d_read,a2
                ;read sector
00000080 4EAA4000
0124            jsr     $4000(a2)
00000084 601C
0125            bra.s   errrw
                ;whoops!
00000086 024100FF
0126            and.w   #255,d1
                ;fold info bytes
0000008A 024200FF
0127            and.w   #255,d2
0000008E 12C2
0128            move.b  d2,(a1)+
                ;store block, then file no.
00000090 1281
0129            move.b  d1,(a1)

0130 ;
00000092
0131 all_okay:
00000092 61000112
0132            bsr     wmd_dwn
                ;idle drives
00000096 4CDF4200
```

```
0133            moveq.l  (a7)+,a1,a6
                ;regain SuperBASIC pointers
0000009A 46FC0000
0134            move    #0,sr
                ;go to interrupts + user mod
e
0000009E 6000FF6A
0135            bra     no_err
                ;all okay
0138 ; Transmission error

0139 ;
000000A2 2A7A01FE
0140 errrw:     move.l  bufptr(pc),a3
000000A6 1AFC003C
0141            move.b  #'<',(a5)+
                ;signal duff read/write
000000AA 1AFC0054
0142            move.b  #'T',(a5)+
000000AE 1AFC0045
0143            move.b  #'E',(a5)+
000000B2 1ABC003E
0144            move.b  #'>',(a5)
000000B6 60DA
0145            bra.s   all_okay
                ;don't report error!!
0148 *h PUT_MSEC procedure

0149 ;

0150 ; Write a specified microdrive
sector.

0151 ; A sector is 512 bytes long.

0152 ;
000000B8 6100014A
0153 putsec:    bsr     arget
                ;check parameters
000000BC 6702
0154            beq.s   1I
000000BE 4E75
0155            rts
                ;bad - leave with error

0156 ;
000000C0 4E40
0157 1I:        trap    #0
                ;enter supervisor mode
000000C2 48E70042
0158            movem.l a1,a6,-(a7)
                ;save SuperBASIC pointers
000000C6 610000A8
0159            bsr     setdv
                ;and select drive

0160 ;
000000CA 303C03E8
0161            move.w  #1000,d0
                ;timeout for sector search
000000CE 323A01D0
0162            move.w  sector(pc),d1
000000D2 48A7C000
0163 2I:        movem.w d0,d1,-(a7)
                ;get sector desired
000000D6 43FA01B2
0164            lea     sc_head(pc),a
1               ;(header buffer)
000000DA 347B012A
0165 3I:        move.w  #d_sectr,a2
                ;read next real one
000000DE 4EAA4000
0166            jsr     $4000(a2)
000000E2 600E
0167            bra.s   20I
                ;bad medium
000000E4 60F4
0168            bra.s   3I
                ;not a sector header
000000E6 4C9F0003
0169            movem.w (a7)+,d0,d1
                ;okay...
000000EA BE01
0170            cmp.b   d1,d7
000000EC 57C8FFE4
0171            dbeq    d0,2I
000000F0 6008
0172            bra.s   writed

0173 ;
000000F2 4C9F0003
0174 20I:       movem.w (a7)+,d0,d1
                ;settle stack and
000000F6 6000FFAA
0175            bra     errrw
                ;report error!

0176 ;
000000FA 227A01A6
0177 writed:    move.l  bufptr(pc),a1
                ;buffer pointer
000000FE 2A49
0178            move.l  a1,a5
00000100 BBFC00000202
0179            add.l   #514,a5
00000106 4280
0180            clr.l   d0
                ;stack file and block
00000108 1025
0181            move.b  -(a5),d0
                ;(file in msb of word)
0000010A E140
0182            asl.w   #8,d0
0000010C 8025
0183            or.b    -(a5),d0
0000010E 3F00
0184            move.w  d0,-(a7)
00000110 347B0126
0185            move.w  #d_write,a2
                ;write sector
00000114 4EAA4000
0186            jsr     $4000(a2)
00000118 301F
0187            move.w  (a7)+,d0
                ;settle stack and assume
0000011A 6000FF76
0188            bra     all_okay
                ;all okay.
0192 *h NHEI$ function

0193 ;

0194 ; Convert supplied value to 'n
digit hex. string

0195 ;
0000011E 347B0118
0196 nhex:      move.w  ca_gtlin,a2
                ;get two long integers
00000122 4E92
0197            jsr     (a2)
00000124 6644
0198            bne.s   80I
                ;whoops!
00000126 5543
0199            subq.w  #2,d3
                ;check 2 arguments
00000128 6640
0200            bne.s   80I
                ;bad!
0000012A 2B349B00
0201            move.l  0(a6,a1.l),d4
                ;collect 'n' (string length)
0000012E 673A
0202            beq.s   80I
                ;zero!!
00000130 0C440008
0203            cmp.w   #8,d4
                ;more than 8?
00000134 6234
0204            bhi.s   80I
                ;yes - ridiculous!
00000136 2049
0205            move.l  a1,a0
                ;room for 8 chars
00000138 5849
0206            addq    #4,a1
0000013A 347B00FE
0207            move.w  ca_itohl,a2
                ;convert
0000013E 4E92
0208            jsr     (a2)
00000140 0B040000
0209            btst    #0,d4
                ;odd length?
00000144 6712
0210            beq.s   20I
                ;no....

0211 ;
00000146 3204
0212            move.w  d4,d1
                ;yes - move it!
00000148 92C1
0213            sub.w   d1,a1
0000014A 1DB49B009BFF
0214 10I:       move.b  0(a6,a1.l),0
1(a6,a1.l)
00000150 5249
0215            addq    #1,a1
00000152 51C9FFF6
0216            dbra    d1,10I

0217 ;
00000156 5549
0218            subq    #2,a1
00000158 92C4
0219 20I:       sub.w   d4,a1
                ;point to string
0000015A 5549
0220            subq    #2,a1
                ;move on a word,
0000015C 3D849B00
0221            move.w  d4,0(a6,a1.l)
                ;and enter string length
00000160 2D490058
0222            move.l  a1,bv_rip(a6)
                ;set arithmetic stack ptr
00000164 7801
0223            moveq   #1,d4
                ;signal as string
00000166 7000
0224            moveq   #0,d0
                ;all okay
00000168 6002
0225            bra.s   90I

0226 ;
0000016A 70F1
0227 80I:       moveq   #err_bp,d0
                ;duff parameters
0000016C 4A80
0228 90I:       tst.l   d0
                ;flag error as well
0000016E 4E75
0229            rts
0232 *h Common routines

0233 ;
0234 ; Switch to the Microdrive giv
n by 'drive'.

0235 ; Return base of system variab
es in A6.

0236 ; (i.e., destroy A6 as base of
BASIC vars!)

0237 ; Must be executed in Supervisc
r mode.

0238 ; Returns in same mode.

0239 ;
00000170 7000
0240 setdv:     moveq   #at_inf,d0
                ;collect sys vars in A6
00000172 4E41
0241            trap    #1
00000174 2C48
0242            movea.l a0,a6
00000176 102E00EE
0243 1I:        move.b  sv_mdrun(a6),
d0              ;wait until drives stop!!
0000017A 66FA
0244            bne.s   1I
0000017C 007C0700
0245            or.w    #$0700,sr
                ;switch off interrupts
000001B0 6100003A
0246            bsr     sys_wser
                ;wait for RS232 to complete
000001B4 267C0001B020
0247            move.l  #md_ctrl,a3
                ;microdrive control register
000001BA 70E7
0248            moveq   #pc_noted,d0
                ;mask out transmit mode
000001BC C02E00A0
0249            and.b   sv_tmode(a6),
d0
00000190 00000010
0250            or.b    #$10,d0
                ;set microdrive mode
00000194 1740FFE2
0251            move.b  d0,pc_tctrl(a
3)              ; - in chip and
00000198 1D4000A0
0252            move.b  d0,sv_tmode(a
6)              ; in system vars
0000019C 323A0100
0253            move.w  drive(pc),d1
                ;drive to switch on
000001A0 61000040
0254            bsr     select
                ;start it up
000001A4 4E75
0255            rts
0258 ; Close down (all) Microdrives

0259 ; Must be executed in supervisc
r mode, and

0260 ; returns in same mode.

0261 ;
000001A6 7000
0262 wmd_dwn:   moveq   #at_inf,d0
                ;(ensure system variables)
000001A8 4E41
0263            trap    #1
000001AA 2C48
0264            movea.l a0,a6
000001AC 267C0001B020
0265            move.l  #md_ctrl,a3
                ;microdrive control register
000001B2 6100004A
0266            bsr     dselect
                ;wind down
000001B6 6100001A
0267            bsr     sys_rser
                ;re-enable RS232
000001BA 4E75
0268            rts
0271 ; Wait for RS232 to complete op
erations.

0272 ; Executed in supervisor mode.

0273 ;
000001BC
0274 sys_wser:
000001BC 536800A6
0275 1I:        subq.w  #1,sv_tmout(a0
)               ;decrement timeout
000001C0 6D0A
0276            blt.s   10I
000001C2 303C208B
0277            move.w  #serdly,d0
000001C6 51C8FFFE
0278 2I:        dbra    d0,2I
                ;wait!!
000001CA 60F0
0279            bra.s   1I
                ;(until timeout expires)
000001CC 426800A6
0280 10I:       clr.w   sv_tmout(a0)
                ;clear wait
000001D0 4E75
0281            rts
0284 ; Reset RS232 mode. Executed in
supervisor mode.

0285 ;
000001D2
0286 sys_rser:
000001D2 70E7
0287            moveq   #pc_noted,d0
                ;mask out transmit mode
000001D4 C02E00A0
0288            and.b   sv_tmode(a6),
d0
000001D8 1740FFE2
0289            move.b  d0,pc_tctrl(a
3)              ;in peripheral chip
000001DC 1D4000A0
0290            move.b  d0,sv_tmode(a
6)              ;and system vars
000001E0 4E75
0291            rts

0292 ;

0293 ;

0294 ; Select microdrive given by D1
on entry.

0295 ; Executed in supervisor mode w
ith interrupts off.

0296 ; A3 contains microdrive contro
l address.

0297 ;
000001E2 7403
0298 select:    moveq   #pc_selec,d2
                ;clock in select bit
000001E4 5341
0299            subq.w  #1,d1

0300
                ;fall through...

0301 ;

0302 ; Switch sequence (used in sele
ct and de-select ops).

0303 ;
000001E6 1682
0304 sdrv1:     move.b  d2,(a3)
                ;clock register high
000001E8 703C
0305            moveq   #60,d0
                ;delay 20uS
000001EA E088
0306            ror.l   #8,d0
000001EC 02020001
0307            and.b   #pc__sclk,d2
                ;clock low
000001F0 1682
0308            move.b  d2,(a3)
000001F2 703C
0309            moveq   #60,d0
                ;delay 20uS
000001F4 E088
0310            ror.l   #8,d0
000001F6 7402
0311            moveq   #pc_desel,d2
                ;clock high - de-select
000001F8 51C9FFEC
0312            dbra    d1,sdrv
                ;(until finished)
000001FC 4E75
0313            rts
0316 ; De-select (all) Microdrives.

0317 ;
000001FE 7402
0318 dselect:   moveq   #pc_desel,d2
                ;clock de-select first
00000200 7207
0319            moveq   #7,d1
                ;(all drives)
00000202 60E2
0320            bra.s   sdrv
0323 ; Check and collect the three s
ector parameters. There

0324 ; should be two integers follow
ed by a 514 byte

0325 ; string array.

0326 ; Sets up locations: 'drive', '
sector', and 'bufptr'.
0327 ;
00000204 220D
0328 arget:     move.l  a5,d1
                ;three arguments?
00000206 928B
0329            sub.l   a3,d1
00000208 0C8100000018
0330            cmp.l   #24,d1
0000020E 6674
0331            bne.s   80I
                ;no - error!
00000210 514D
0332            subq    #8,a5
                ;collect two integers
00000212 34780112
0333            move.w  ca_gtint,a2
00000216 4E92
0334            jsr     (a2)
00000218 4A80
0335            tst.l   d0
                ;check errors
0000021A 6668
0336            bne.s   80I
                ;whoops!
0000021C 0C430002
0337            cmp.w   #2,d3
00000220 6662
0338            bne.s   80I
                ;weren't two?!
00000222 45FA007A
0339            lea     drive(pc),a2
                ;okay store them
00000226 24F69800
0340            move.l  0(a6,a1.l),(a
2)+
0000022A 504B
0341            addq    #8,a3
                ;check array type next
0000022C 504B
0342            addq    #8,a3
0000022E 0C3600038B00
0343            cmp.b   #3,0(a6,a3.l)
00000234 664E
0344            bne.s   80I
                ;nope!
00000236 720F
0345            moveq   #$f,d1
                ;okay, check string array
00000238 C236B801
0346            and.b   1(a6,a3.l),d1
0000023C 0C010001
0347            cmp.b   #1,d1
00000240 6642
0348            bne.s   80I
                ;nope!
00000242 2A6E0028
0349            move.l  bv_vvbas(a6),
a5              ;okay, get pointer to it
00000246 2876B804
0350            move.l  4(a6,a3.l),a4
                ; - descriptor base
0000024A D9CD
0351            add.l   a5,a4

0000024C DBFAC800
0352            add.l   0(a6,a4.l),a5
                ; - array values pointer
00000250 0C760202CB06
0353            cmp.w   #514,6(a6,a4.
l)              ;check array is big enough
00000256 662C
0354            bne.s   80I
                ;naughty!
00000258 3DBC0202DB00
0355            move.w  #514,0(a6,a5.
l)              ;assume array will be filled
0000025E 49FA0B02
0356            lea     2(a6,a5.l),a5
                ;and point to array data
00000262 2480
0357            move.l  a5,(a2)
                ;store buffer pointer
00000264 594A
0358            subq    #4,a2
                ;finally, check ranges
00000266 3212
0359            move.w  (a2),d1
                ;drive is '1' or '2'
00000268 4881
0360            ext     d1
0000026A 5341
0361            subq    #1,d1
0000026C 6704
0362            beq.s   10I
                ;was '1' - okay
0000026E 5341
0363            subq    #1,d1
00000270 660E
0364            bne.s   70I
                ;whoops!
00000272 322A0002
0365 10I:       move.w  2(a2),d1
00000276 0C410100
0366            cmp.w   #256,d1
                ;sector is 0..255
0000027A 6404
0367            bhs.s   70I
                ;whoops!
0000027C 7000
0368            moveq   #0,d0
                ;okay - signal that
0000027E 6006
0369            bra.s   90I
                ;all is well.

0370 ;
00000280 70FC
0371 70I:       moveq   #err_or,d0
                ;bad range
00000282 6002
0372            bra.s   90I
00000284 70F1
0373 80I:       moveq   #err_bp,d0
                ;bad parameters
00000286 4A80
0374 90I:       tst.l   d0
                ;signal error return

00000288 4E75
0375            rts
0378 *h Data area

0379 ;

0380 ;

0381 ; Sector header buffer area.

0382 ;

0383            align
0000029E 00
0384 sc_head:   defs    20              ;spa
ce enough!

0385
0386 ; The following three loca
tions must be kept together

0387 ; and in this order.

0388 ;
0000029E 0000
0389 drive:     defw    0               ;dri
ve request (1 or 2)
000002A0 0000
0390 sector:    defw    0               ;sec
tor request (0..255)
000002A2 00000000
0391 bufptr:    defl    0               ;buf
fer pointer
0394 end
```

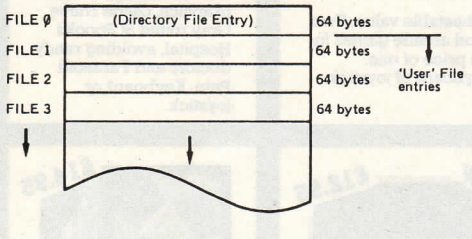
ing from unity upwards. There are some other 'files' that the system knows about and which will be found on viewing the mapping sector.

$00 — The directory file.
$F8 — The mapping file (ie. sector 0, 1 block long!!)
$FC — The block is pending a delete operation, you should never see this at this level.
$FD — The block (sector) is unused.
$FE — The block (sector) is bad.
$FF — The block (sector) does not exist.

Note that this explains the two messages the QL produces on formatting a cartridge and then immediately doing a directory operation on it. When a cartridge is formatted a message of the form '202/206 sectors' appears. This means that 206 sectors could be created and 202 of them were verified as being good ones. If a directory is requested, the medium's title is given followed by (in this case) '200/202 sectors'. This means that out of the 202 good sectors that exist, 200 of them are left for our use (ie. 100kbytes of storage). The reason why we are 2 down before even starting is because the directory file (file 0) always exists and starts off just one block/sector long, and the mapping sector (file $F8) always exists and is always just one block long.

The Directory File

QDOS creates and maintains a directory file on each cartridge. It has a file header the same as any other file. Every time a new file is saved, an entry is made in the directory file. If the directory file runs out of space in its current block, another sector will be allocated if possible, or a 'directory full' message will appear. Each new entry in the directory file is in fact the 64 byte file header that is also stored at the beginning of each file *(Figure 3)*. The important point is that file numbers (below $F8) are an index into the directory file.



The position of the directory entry for any file is given as:

file_number * 64. Now you can see why the 'internal' directory file is file zero. The position in the directory file of the entry for the directory file is '0 * 64 = 0'. That is, at the very beginning. We know that at the beginning of every file there is a file header that has the same form as the directory entry. In the case of the directory file it is simply that the file header and the directory entry are one and the same bit of stored data (if that doesn't 'shiver yer timbers' then nothing will!).

SuperBasic Extensions

There are three extensions to the SuperBasic language, the assembler source and object listing being shown in *Figure 4*. Their use is explained at the top of the source listing. Assuming you have an Assembler, simply create a copy of the source file, assemble it, and create a code file on MDV1_ called 'MDRIVE_CODE'. The following short program is then used to extend SuperBasic whenever you need to.

```
10 base=RESPR(900)
20 LBYTES mdv1_mdrive_code,base
30 CALL base
```

If you don't have an Assembler (or you do but you prefer to use a known working copy) then all the necessary files and programs in this article can be obtained by using the *QL User* 'Microdrive Exchange'.

These extensions, together with the theory presented above, enable

LISTING 5

```
115 DIM sz$(514),bf$(514),de$(514),n
$(256)
120 bf=0:de=0: fno=0:dptr=0
125 CLS:PRINT 'File recovery program
'
130 PRINT'Cartridge must be in MDV1_
'\\
135 INPUT'Name of file to recover? '
;f$
140 GET_MSEC 1,0,sz$: fno=dir_entry
145 IF NOT(fno)
150    PRINT'Cannot find ';f$: STOP
155 ELSE
160    PRINT'Was file number ';fno
165 END IF
170 scan_drive(fno)
175 update_dir: update_map
180 PRINT'All okay - recovered (';f$
;')'
185 STOP
190 :
195 DEFine FuNction dir_entry
200 LOCal blk,n,ptr,found: blk=0
205 de=find_dblk(blk)
210 IF de
215    GET_MSEC 1,de,de$: found=0
220    FOR n=0 TO 7
225       ptr=n*64+16+1
230       IF de$(ptr TO ptr+LEN(f$)-
1)=f$
235          found=1:EXIT n
240       END IF
245    END FOR n
250    IF found
255       RETurn blk*8+n
260    ELSE
265       blk=blk+1: GO TO 205
270    END IF
275 ELSE
280    RETurn 0
285 END IF
290 END DEFine
295 :
300 DEFine FuNction find_dblk(bn)
305 LOCal n
310 FOR n=1 TO 511 STEP 2
315    IF sz$(n)=CHR$(0)
320       IF sz$(n+1)=CHR$(bn)
325          RETurn (n-1)/2:END DEFi
ne
330       END IF
335    END IF
340 END FOR n
345 RETurn 0
350 END DEFine
355 :
360 DEFine PROCedure scan_drive(fnum
)
365 LOCal n,sct,c,base
370 FOR n=1 TO 256: n$(n)=CHR$(0)
375 FOR sct=1 TO 254
380    PRINT 'Scanning sector ';sct
385    IF sz$(sct*2+1)=CHR$(253)
390       GET_MSEC 1,sct,bf$
395       IF bf$(514)=CHR$(fnum)
400          c=CODE(bf$(513))
405          n$(sct+1)=CHR$(c+1)
410          IF c=0: base=sct: END IF

415          PRINT'  - found block ';
c
420       END IF
425    END IF
430 END FOR sct
435 GET_MSEC 1,base,bf$
440 END DEFine
445 :
450 DEFine PROCedure update_dir
455 dptr=1+((fno MOD 8)*64)
460 de$(dptr TO dptr+15)=bf$(1 TO 16
)
465 PRINT'Updating directory file'
470 PUT_MSEC 1,de,de$
475 END DEFine
480 :
485 DEFine PROCedure update_map
490 LOCal lp
495 FOR lp=1 TO 256
500    IF (n$(lp)<>CHR$(0))
505       sz$(lp*2-1)=CHR$(fno)
510       sz$(lp*2)=CHR$(CODE(n$(lp)
)-1)
515    END IF
520 END FOR lp
525 PRINT'Updating mapping sector'
530 PUT_MSEC 1,0,sz$
535 END DEFine
```

us to start having some fun (if that is what you call trying to recover one of your precious files!). Perhaps the most straightforward example is that of recovering a deleted file.

Instant Restoration

Fortunately for us, QDOS performs few changes to a cartridge when a file is deleted. The main point to remember is that we can only successfully restore one or more deleted files to the directory if no file saving has been performed since the delete(s) took place. Clearly, if a file has been saved since a delete, there is no reason to suppose that it would not use up a deleted file's directory entry, and/or some sectors used to store the original file.

First of all, let's think of what happens when a file is saved. A file number is allocated to it, which if multiplied by 64 will provide a pointer to the start of the directory entry in the directory file. Sufficient sectors will have been allocated to store the file and each of these sectors will have been given a block header containing the file number and the relevant block number (from zero onwards).

When a file is deleted the following happens. The first 16 bytes of the directory entry are filled with zeros. This has the important attribute that the file name still exists in the directory, it's just that the DIR command will fail to see it. Second, the mapping sector entries for the erased file are returned to the pool of free ones by being filled with the data word $FD00 (ie, file $FD:empty:block0). These are the only two operations performed. So, as already noted, we still have the name in the directory. Just as importantly, we still have all the saved data sectors for the file intact, together with their stored block headers.

The listing given in *Figure 5* is a SuperBasic program that will recover a deleted file on a microdrive cartridge. First the program sets off to find the specified file name in the directory file. If found, its file number is returned and another procedure 'scan_drive' is used to scan through all the data sectors collecting sector and block numbers of all sectors relating to that file number. Only 'empty' (ie, empty as far as the mapping file is concerned) sectors are scanned. The process is quite slow, about 25 minutes for an almost empty microdrive, but is obviously quicker the fuller the cartridge is. In any event it is usually quicker than trying to rewrite your work from scratch. The sector scanner returns block zero of the deleted file and the first 16 bytes of this block are then used to update the directory file to its original status.

Last, but far from least, the mapping sector is updated by replacing all the appropriate references to used sectors. It is unlikely that QDOS will have noticed (due to internal buffering) that we have changed the directory, so to see your previously deleted file appear in its full glory simply reset the QL and then perform a directory. Magic, eh?

Cure For Bad Mediums

This is a bit more tricky. The main problem is trying to sort out what has happened. Is it a totally corrupted mapping sector that is causing the error, or is it a bad file sector somewhere. Note that QDOS normally complains only if it gets a duff sector or, for some reason, the file and block numbers supplied by the mapping sector do not agree with those found in the block header of the corresponding data sector. Let's explore a few avenues.

No matter what else we will try and do, the basis of our recovery attempts is the mapping and use of the individual sectors. If we think that the mapping sector may be OK, the program in *Figure 6* will be fine. This simple program scans the mapping sector for used sectors and lists the entire mapping of a cartridge. If we don't trust the mapping sector (and wish to recreate a suitable 'good' one), the procedure 'scan_drive' can

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LISTING 6

```
140 prt=0:CLS:PRINT 'Microdrive mapp
er'
150 PRINT'Cartridge must be in MDV1_
'\\
160 INPUT 'Copy to printer (y/n)? ';
r$
170 IF r$<>'y':GO TO 220:ELSE :prt=1
180 INPUT 'Printer channel spec.?  '
;r$
190 IF r$(1 TO 3)<>'ser':GO TO 210
200 INPUT 'Baud Rate?  ';r: BAUD r
210 OPEN£3,r$
220 scan_drive(prt)
230 PRINT'Finished.'
240 IF prt=1:PRINT£3,'Finished.':CLO
SE£3
250 STOP
260 :
270 DEFine PROCedure scan_drive(p)
280 LOCal sct,c: DIM sz$(514),bf$(51
4)
290 GET_MSEC 1,0,sz$
300 FOR sct=1 TO 254
310    PRINT'Sector ';sct;TO 12;' -
';
320    IF prt=1
330     PRINT£3,'Sector ';sct;TO 12;
' - ';
340    END IF
350    c=CODE(sz$(sct*2+1))
360    SELect ON c
370    =0:PRINT'directory file'
380     IF prt=1:PRINT£3,'directory
file'
390    =253:PRINT'empty'
400     IF prt=1:PRINT£3,'empty'
410    =254:PRINT'bad sector'
420     IF prt=1:PRINT£3,'bad sector
'
430    =255:PRINT'<null>'
440     IF prt=1:PRINT£3,'null'
450    =REMAINDER :
460     GET_MSEC 1,sct,bf$
470     PRINT'file ';CODE(bf$(514));
480     PRINT'  block ';CODE(bf$(513
))
490     IF prt=1
500      PRINT£3,'file ';CODE(bf$(51
4));
510      PRINT£3,'  block ';CODE(bf$
(513))
520     END IF
530    END SELect
540 END FOR sct
550 END DEFine
```

be changed so that all sectors are scanned.

Once we have the mapping of the cartridge we can check that the block numbers for any one file are contiguous. If not, the missing ones are almost certainly corrupt sectors. Either way, our recovery attempt is reasonably straightforward. We will now know which sectors hold which files and also the appropriate order of the sectors to read (ie, the order is by block number). We could now write a simple program to open up a channel on another 'good' device, read the appropriate order of sectors from the bad cartridge, and write the sector data to the output channel. We must remember two things here. First, the output channel will not require the 64 byte header from our block zero. Second, we must only write the data to the output channel, that is, the first 512 bytes of our buffer array.

Clearly if we had missing blocks in a sector sequence for a file, we had better skip those sectors when transferring our data to another medium. The point about our recovery attempt under these circumstances is that we want to get back as much as we can! If it really was the mapping sector that went west, we ought to still be able to recover all of our original files.

Next Month we'll turn our attention to the slightly trickier medium of floppy disks.

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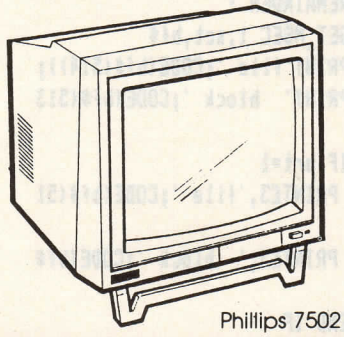

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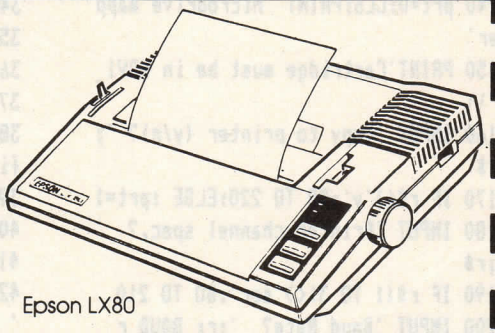

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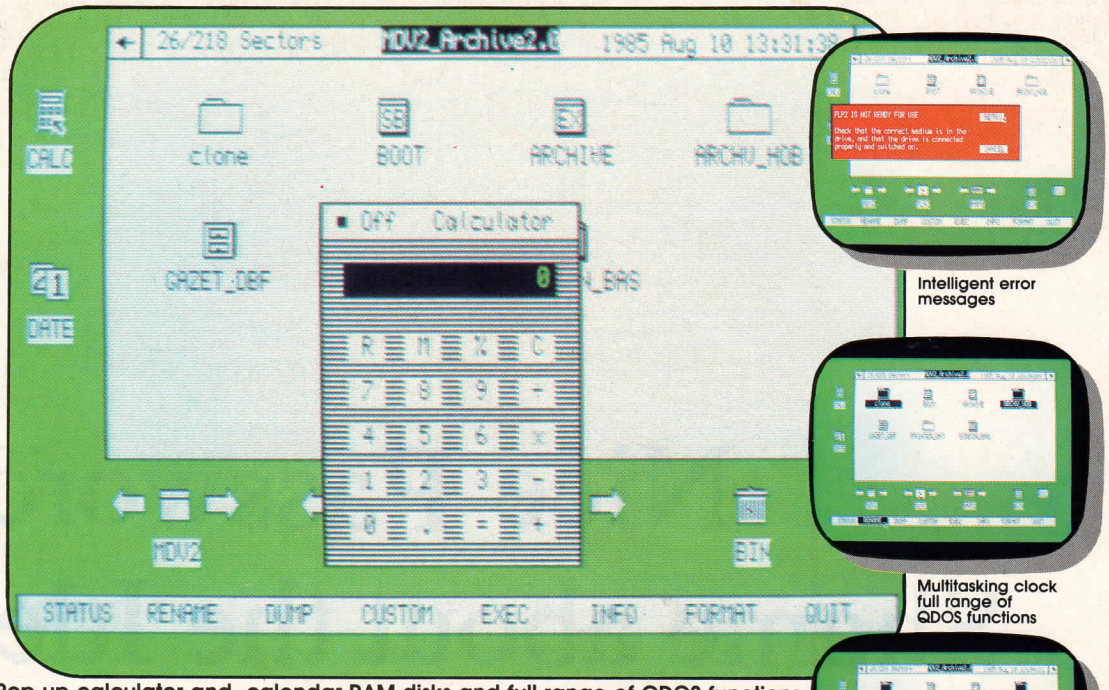

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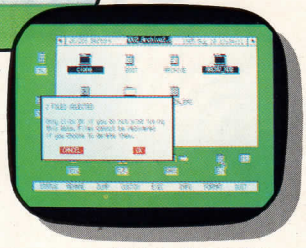

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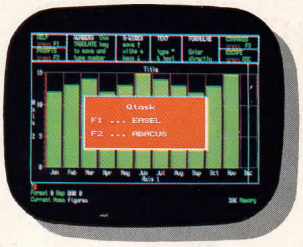

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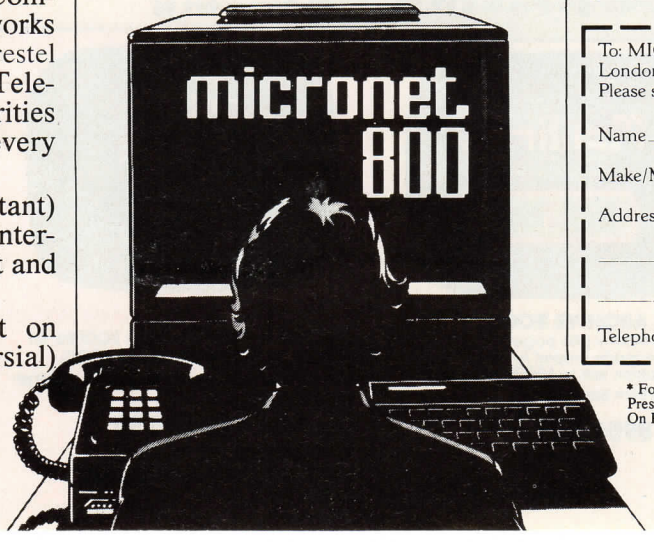

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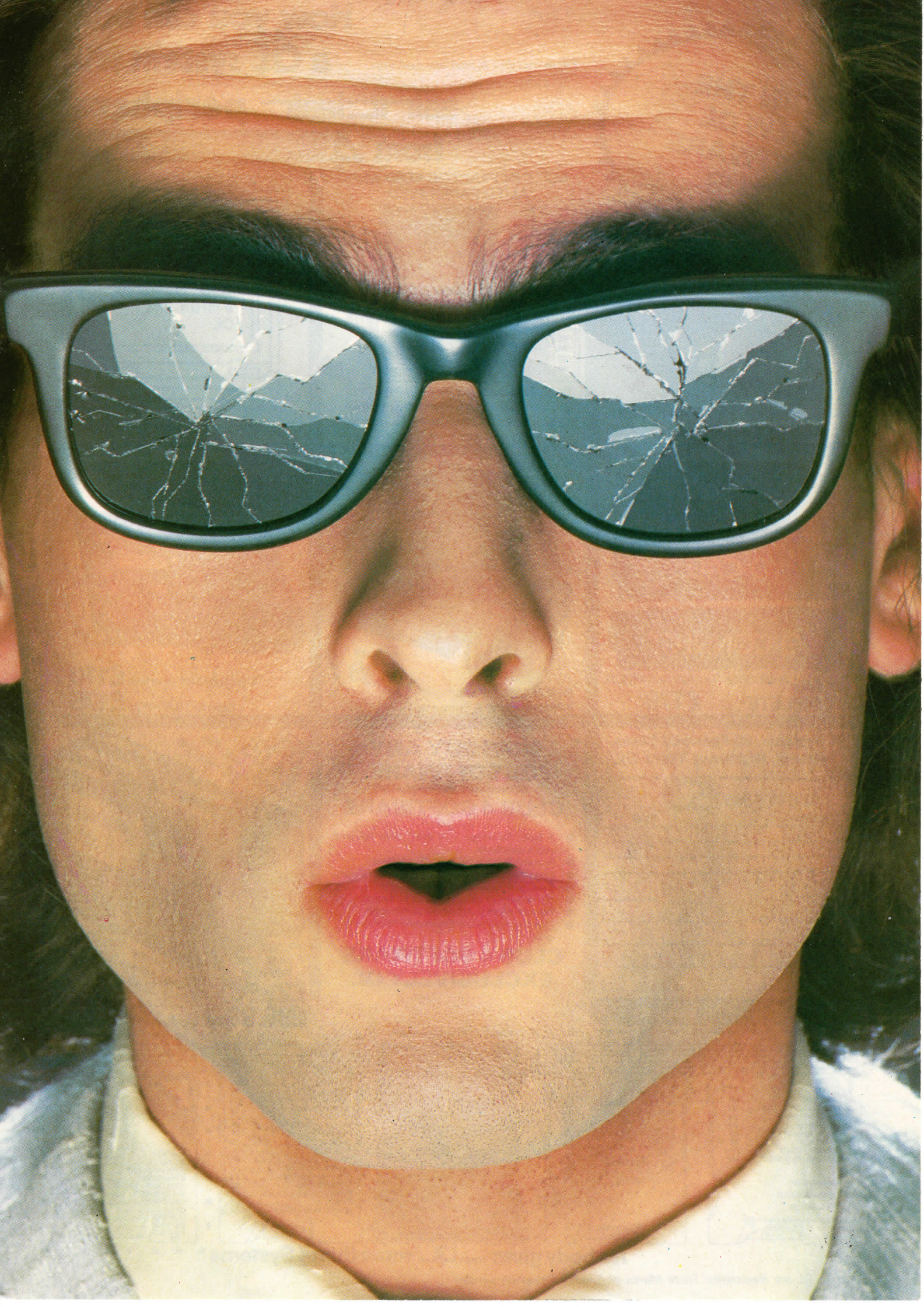

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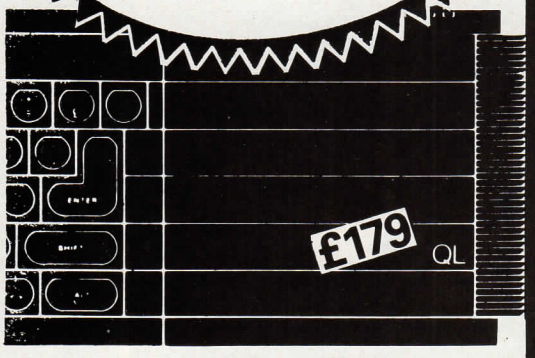

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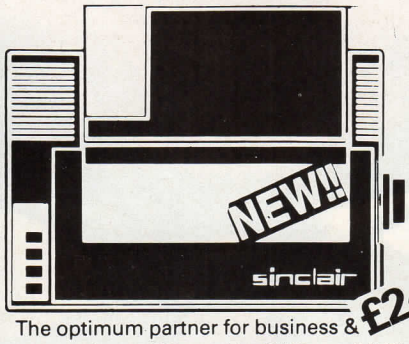

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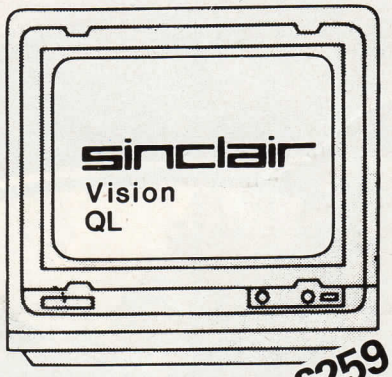

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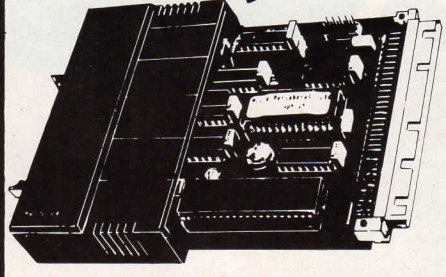

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BOOKMARKS

Nicky Trevett reviews selected books for the QL and computing in general.

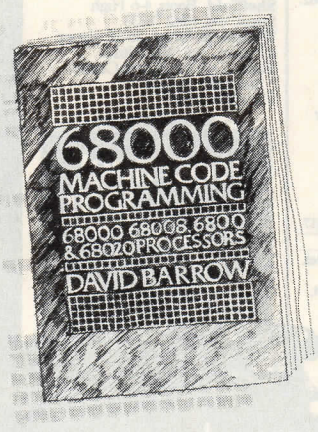
Books about the QL computer, and indeed all Sinclair micros, already abound, but books about the man behind the home computer revolution are few and far between. Rodney Dale attempts to redress the balance with his *The Sinclair Story*, published by Gerald Duckworth & Co at £9.95.

It is a rare compliment to find yourself the subject of a biography in your own lifetime, and certainly Sir Clive should find little to distress him in this friendly, admiring (but not blinkered) look at his life and inventions.

After the first chapter, dealing with family, childhood and early activities like editing *Practical Wireless*, the narrative moves on to the setting up of the first company, Sinclair Radionics, and starts to gather pace. It makes truly fascinating reading, filling in the gaps in a story that most of us thought we already knew.

Here is the history of Sinclair hi-fi, the rise and fall of the pocket calculator, the miniature television, and of course the microcomputers. As episode follows episode, Sir Clive himself tends to fade into the background and attention is focussed on the companies and the progress of the often shaky but always spectacular and innovative projects.

It is entertaining and immensely readable, and whatever you might think about the Black Watch disaster or the unreliability of the calculators, you emerge at the end (as the author intends) with no doubt at all that in his own way, the ever-optimistic Sir Clive is a genius, if sometimes a rather tragic genius. And the ending is, inevitably, shadowed by the failure of the C5 and the financial troubles besetting Sinclair Research.



The 68000 chip has undoubtedly seized the imagination of assembly language programmers, for here is yet another book especially for them.

68000 Machine Code Programming by David Barrow is published by Collins at £12.95, and aims to impart just about everything the assembly language programmer needs to know about the 68000 family, including the "massive" 68020.

The book is loosely divided into four parts. There's a section dealing with the internal architecture of the processors, a large chapter devoted to assembly language programming in a general way, which includes some useful hints, and two chapters looking at instructions and addressing modes. Several routines are provided in the course of this part of the book which should also prove handy.

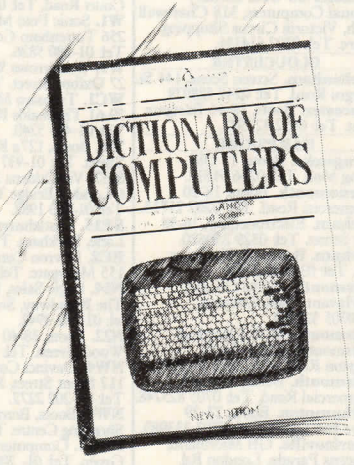
The last section, comprising well over half the book, is the reference section, tables of registers, instructions and so on.

It's a serious treatment of a highly technical subject, and certainly not for newcomers to machine code. But it's competent and as comprehensive as a book of this size (230 pages) can be, and particularly useful for anyone wanting to upgrade their programming from the earlier chips to the 68020.

The C programming language has deservedly established itself as a fashion, and next is a book that aims to teach you all about it. *C Primer Plus* by Mitchell Waite, Stephen Prata and Donald Martin, published by Pitman Publishing and costing (take a deep breath) £18.50, looks and sounds dauntingly like a text book. It is also large and very heavy. But don't let this put you off; it claims as early as the front cover to be a "user friendly guide" to C, and it is.

The emphasis throughout is on experimentation and practice. Some, but not very much, programming experience is assumed. The Plus, say the authors, comes in the question and answer sections at the end of each section, the breadth of the topics covered, the fact that a look at Unix is included, and the cartoons.

For a primer, it covers impressive ground, from What is C? to using advanced structures, taking in data, operators, I/O functions, loops,



arrays and pointers on the way. There are also several appendices, dealing with keywords, C operators, data types, program flow control and more.

The book advises that you'll need access to a computer with a C compiler to make best use of it.

There are several good books on C available, but I particularly liked this one for its enthusiasm and ability to engage the interest of the reader. It is easy to read, and therefore easy to learn from, with a light touch and characters like Ichabod Bodie Marfoote infesting the text to keep you smiling. Expensive, but recommended.

And now, just for a change, a look at three recently introduced computer dictionaries jostling for space on your shelf.

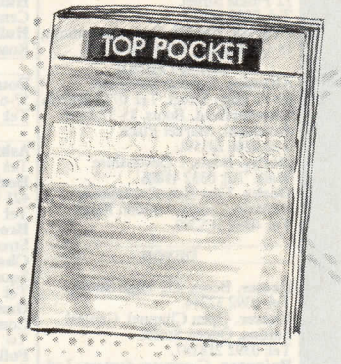
The Penguin Dictionary of Computers, by Anthony Chandor and priced at £3.95, is on its third edition and has been updated, it says, to take into account such developments as the rise of personal computers. Sphere's *Dictionary of Computing* costs £4.95 and was published in 1983; reviewed here is the first paperback version, which, ominously, does not seem to have been updated since the book first appeared in 1983. The third offering is also the smallest, the tiny pocket *Microelectronics Dictionary* by Malcolm Plant, published by Longman at £1.50.

The Penguin Dictionary, as might be expected from such an illustrious stable, is well researched and written, and pleasant to use. It's suitable for both business and home use – 'joystick' is in there, and 'spreadsheet', although it hasn't heard of integrated software, which won't please Psion.

It's certainly better than Sphere's effort, which, to do it justice, is aimed more at academics and industrial users. It adopts a much more technical approach to its definitions, is not so clearly presented, and doesn't know about such things as joysticks and spreadsheets.

Neither dictionary could be said to be written with QL users in mind — you won't find 'microdrive' in either of them, for example.

The baby of the trio turned out to be a surprise. *Microelectronics Dictionary* covers "the science and technology of microelectronics", including space research, medicine, telecomms, computers and consumer products, but still finds room for items missing



from the two bigger dictionaries — 'dongle', for example, 'sprite graphics', even 'microdrive', at last!

Its definitions of basic computing terms tend to be less deep but also more immediately comprehensible than the opposition, and all in all, it represents good value for money.

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Oldham. Home & Business Computers, 54 Yorkshire Street. Tel: 061-633 1608.
Oldham. Boots, 1 Town Square Shopping Centre. Tel: 061-624 2525
Stockport. National Micro Centres, 36 St Peters Gate. Tel: 061-429 8080

MERSEYSIDE

Liverpool. Hargreaves, 31-37 Warbreck Moor, Walton. Tel: 051-525 1782.
St Helens. Microman Computers, Rainford Industrial Estate, Mill Lane, Rainford. Tel: 0744 885242.
Southport. Boots, 31-39 Chapel Street. Tel: 0704 33907.
St. Helens. Boots, 8 Church Street, 24 La Grange Arcade. Tel: 0744 25488.

MIDDLESEX

Harrow. Camera Arts, 42 St. Anns Road, Tel: 01-427 5469.
Hounslow. Boots, 193-199 High Street. Tel: 01-570 0156.
Southall. Twillstar Computers Ltd, 7 Regina Road. Tel: 01-574 5271.
Teddington. Andrews, Broad Street. Tel: 01-977 4716.
Twickenham. Productive Computers Ltd, 72 Heath Road. Tel: 01-891 4991.
Uxbridge. JKL Computers, 7 Windsor Street. Tel: 0895 51815.

NORFOLK

Norwich. Adams, 125-129 King Street. Tel: 0603 22129.
Thetford. Thetford CB & Micros, 21 Guildhall Street. Tel: 0842 61645.

NOTTINGHAMSHIRE

Mansfield. Boots, 39 Four Seasons Shopping Centre, Tel: 0623 23089.
Nottingham. Boots, 11-19 Victoria Centre. Tel: 0602 470676.
Nottingham. Telstar, 280 Huntingdon Street. Tel: 0602 505585.
Worksop. Computer Graphix, 32 Bridge Street. Tel: 0909 472248.

NORTHAMPTONSHIRE

Kettering. Boots, 35 Gold Street. Tel: 0536 514675.
Northampton. Boots, 9 The Parade. Tel: 0604 22573

NORTHUMBERLAND

Morpeth. Telerents (Northern) Ltd, 31 New Gate Street. Tel: 0607 513537.

OXFORDSHIRE

Abingdon. Ivor Fields Computers, 21 Stert Street, Tel: 0235 21207.
Banbury. Computer Plus, 2 Church lane. Tel: 0295 55890.
Oxford. Science Studio, 7 Little, Clarenden Street. Tel: 0865 54022.
Oxford. Absolute Sound and Video, 19 Old High Street, Headington, Tel: 0865 65661.

SCOTLAND

Aberdeen. Boots, 133-141 Union Street. Tel: 0224 585349.
Dundee. Boots, 49-53 High Street, Tel: 0382 21756.
Edinburgh. Boots, 101-103 Princes Street. Tel: 031-225 8331.
Edinburgh. Microworld Computer Group. 12 Leven Street. Tel: 031 228 1111
Edinburgh. Edinburgh Computers, 51-57 Lothian Road. Tel: 031 229 4418.
Edinburgh. Silicon Centre, 7 Antigua Street. Tel: 031 557 4546.
Glasgow. Boots, 200 Sauchiehall Street. Tel: 041 332 1925.
Glasgow. Microworld Computer Group, 11 Bath Street. Tel: 041 332 1116.
Glasgow. Boots, Union Street and Argyle Street. Tel: 041 248 7387.
Glasgow. Tom Dixon Cameras, 15-17 Queen Street. Tel: 041-204 0826.
Glasgow. Commscot Ltd, 30 Gordon Street. Tel: 041 226 4878.
East Kilbride. Boots, 33-37 The Plaza. Tel: 035 52 20629.
Falkirk. Boots, 79-91 High Street. Tel: 0324 20535.
Hamilton. Tom Dixon Cameras, 8 Cadzou Street. Tel: 0698 283193.
Peterhead. North East Computers. 1 Ellis Street. Tel: 0779 79900.

SHROPSHIRE

Shrewsbury. Computerama, 13 Castlegate. Tel: 0743 60528.
Telford. Computer Village, 2/3 Hazeldine House, Central Square. Tel: 0952 506771.
Telford. Telford Electronics, 38 Mall 4. Tel: 0952 504911.

SOMERSET

Taunton. Boots, 64-65 High Street. Tel: 0823 76061.

STAFFORDSHIRE

Newcastle-under-Lyme. Computer Cabin, 24 The Parade, Silverdale. Tel: 0782 636911.
Stoke on Trent. Town Computer Store, 30 Town Road, Hanley. Tel: 0782 287540.
Stoke on Trent. Boots, 3-5 Market Square, Hanley. Tel: 0782 23271.

SUFFOLK

Bury St. Edmunds. Boots, 11-13 Cornhill. Tel: 0284 701516.
Bury St. Edmunds. The Suffolk Computer Centre, 1-3 Garland Street. Tel: 0284 705503.
Ipswich. Computer Magic, 24 Crown Street. Tel: 0473 50965.

SURREY

South Croydon. Concise Computer Consultants. 1 Carlton Road. Tel: 01-681 6842.
Croydon. The Vision Store, 53-59 High Street. Tel: 01-686 6362.
Croydon. Boots, The Mall, 12-18 Whitgift Centre. Tel: 01-688 6021.
Epsom. The Micro Workshop, 12 Station Approach. Tel: 0372 721533.
Guildford. Guildford Computer Centre, 5 The Quadrant, Bridge Street. Tel: 0483 578848.
Wallington. Surrey Micro Systems, 53 Woodcote Road. Tel: 01-647 5636.
Woking. Harpers, 71-73 Commercial Way. Tel: 0486 225657.

SUSSEX

Brighton. Boots, 129 North Street. Tel: 0273 27088.
Brighton. Gamer, 71 East Street. Tel: 0273 728681.
Bognor Regis. Bits & Bytes, High Street. Tel: 0243 867143.
Eastbourne. Boots, 15 Eastbourne Arndale Centre. Tel: 0323 27742.
Horsham. Boots, 1 Swan Walk, Tel: 0403 53053.
Horsham. Orchard Computer Centre, 34 East Street. Tel: 0403 64884.
Worthing. Boots, 48-52 Montague Street. Tel: 0903 207106.

TYNE & WEAR

Newcastle-upon-Tyne. Boots, Eldon Square. Tel: 0632 329844.
Newcastle-upon-Tyne. RE Computing, Parkview House, Front Street, 4 Lane Ends. Tel: 091 2701740.
Sunderland. Business Micro Communications Ltd, Refuge Assurance Buildings, Saint Thomas Street, West Sunniside. Tel: 0783 654916.

WALES

Aberdare. Inkey Computer Services, 70 Mill Street, The Square, Trecynon. Tel: 0685 881828.
Aberystwyth. Aberdata at Galloways, 23 Pier Street. Tel: 0970 615522.
Cardiff. Boots, 36 Queens Street & 105 Frederick Street. Tel: 0222 31291.
Cardiff. The Computer Shop, 41 The Hayes. Tel: 0222 26666.
Cardiff. Cardiff Microcomputers, 46 Charles Street. Tel: 0222 373072.
Newport. Gwent Computers, 92 Chepstow Road. Tel: 0633 841760.
Newport. Boots, 155-156 Commercial Street. Tel: 0633 51212.
Swansea. Boots, 17 St. Marys Arcade, The Quadrant Shopping Centre. Tel: 0792 43461.
Swansea. The Micro Store, 35-36 Singleton Street. Tel: 0792 46980.

WARWICKSHIRE

Coventry. Boots, 38-42 Corporation Street. Tel: 0203 26561.
Leamington Spa. Boots, 31 Parade. Tel: 0926 24945.
Leamington Spa. Leamington Hobby Centre 121 Regent Street. Tel: 0926 29211.
Nuneaton. Micro City, 1a Queens Road. Tel: 0203 382049.
Rugby. O.E.M., 9-11 Regent Street. Tel: 0788 70522.

WEST MIDLANDS

Birmingham. Boots, City Centre House, 16-17 New Street. Tel: 021-643 7582.
Dudley. Central Computers, 35 Churchill Precinct. Tel: 0384 238169.
Stourbridge. Walters Computer Systems. 12 Hagley Road. Tel: 0384 370811.
Walsall. New Horizon, 1 Goodall Street. Tel: 0922 24821.

WILTSHIRE

Trowbridge. West Wiltshire Micros, Whiteheart Yard. Tel: 02214 67259.

YORKSHIRE

Bradford. Boots, 11 Darley Street. Tel: 0274 390891.
Doncaster. Boots, 13-15 French Gate, Tel: 0302 62238.
Barnsley. Boots, 34-40 Cheapside. Tel: 0226 82616.
Huddersfield. Micro World Computers, 1006-1010 Manchester Road, Linthwaite. Tel: 0484 846117.
Huddersfield. Boots, 22 King Street. Tel: 0484 21756.
Leeds. Boots, 19 Albion Arcade, Bond Street Centre. Tel: 0532 33551.
Leeds. Micro Power, Northwood House, North Street. Tel: 0532 458800.
Sheffield. PIP Micro Communications, 9 Taptown Crescent, Broomhill. Tel: 0742 661096.
Sheffield. Boots, 4-6 High Street. Tel: 0742 78333.
Wakefield. Boots, 26-28 Upper Kirkgate. Tel: 0924 376181.
York. York Computer Centre, 7 Stonegate Arcade. Tel: 0904 641862.

Phone 01-278 3143 for your free information pack now !

Micronet 800, 8 Herbal Hill, London EC1.

PUZZLE PAGE

Another teasing computer problem from Marcus Jeffery, our resident problem poser and technical author.

This month's prize problem will really get you thinking. Don't rush into anything! The solution might take you less than an hour, or could keep your micros whirring into the middle of next week, possibly next year!

A lecturer first introduced me to this problem, though in a slightly different form. You simply have to generate the series of numbers which have the form:

3^i7^j where: i>=0 and j>=0

Easy isn't it? The expansion of 3^i will look like:

1, 3, 9, 27, 81, 243, 729, 2187, 6561, 19683, . . .

and the expansion of 7^j will be:

1, 7, 49,343, 2401, 16807, 117649, 823543, . . .

Now, if we multiply all combinations of these numbers together, in order, we get:

1x1, 3x1, 1x7, 9x1, 3x7, 27x1, 1x49, 9x7, . . .

or:

1, 3, 7, 9, 21, 27, 49, 63, . . .

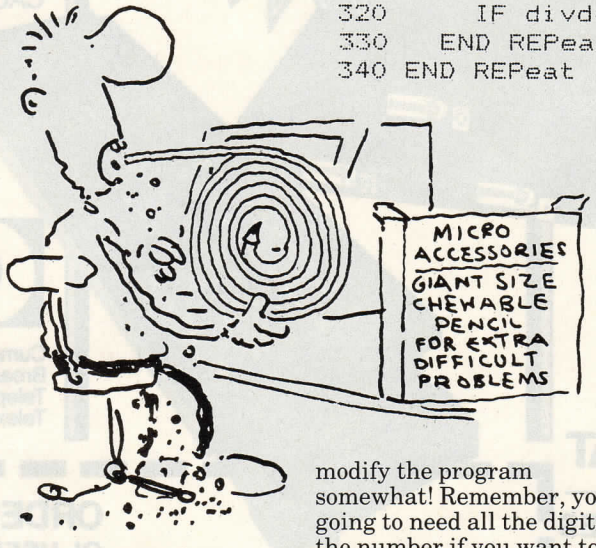
giving the series shown in *Figure 1*.

FIGURE 1

Count	Number
1	1
2	3
3	7
4	9
5	21
6	27
7	49
8	63
9	81
10	147
11	189
12	243
13	343
14	441
15	567
16	729
17	1029
18	1323
19	1701
20	2187
21	2401
22	3087
23	3969
.	.
.	.
.	.

To win the prize of a free year's subscription to *QL User*, all you have to do is find the 1500th number in the series. Having found this number, add up all the digits in the number and enter the result on the form below. For instance, from *Figure 1*, if I'd asked for the 20th number in the series, then the result would be 18 (ie. 2+1+8+7).

If you're a budding genius, then you might want to work this out by hand, but the rest of us will undoubtedly write a program to find the answer. Feeling generous, I decided to give you the program to do it *(Figure 2)*. The variable 'number' simply generates all odd numbers, starting at one. Then for each odd number, the 'sevens' REPeat loop divides it by seven as many times as possible, such that it still



obtains an integer result. Having done this, the 'threes' REPeat loop divides the result by three as many times as possible. If after all this the final result is one, then the number must be in the series, so it's printed and 'count' is updated.

If you type this in and run it, you'll begin to get the series shown in *Figure 1*. Were you to go away for a day or two, then you might expect to come back and find the solution waiting for you. Unfortunately, the QL can only handle integers up to 32767, which will only give you the first 33 numbers, so I'm afraid you'll have to modify the program somewhat! Remember, you're going to need all the digits in the number if you want to enter the competition.

Finally, I'd also be interested to see any elegant SuperBasic solutions to this problem, and I'll be including one or two of the most stylish when giving the results.

FIGURE 2

```
100 count=1
110 number=1 : REMark  3^0*7^0
120 REPeat series
130   PRINT count,number
140   count=count+1
150   REPeat divide
160     number=number+2
170     divd=number
180     REPeat sevens
190       IF divd/7 = divd DIV 7 THEN
200         divd=divd/7
210       ELSE
220         EXIT sevens
230       END IF
240     END REPeat sevens
250     REPeat threes
260       IF divd/3 = divd DIV 3 THEN
270         divd=divd/3
280       ELSE
290         EXIT threes
300       END IF
310     END REPeat threes
320     IF divd=1 THEN EXIT divide
330   END REPeat divide
340 END REPeat series
```

RULES:

All entries must be written on the panel provided on this page. Any other form of entry will be disqualified.

Entries must be sent by post to this address:

PUZZLE PAGE,
QL User,
Priory Court,
30-32 Farringdon Lane,
London EC1R 3AU

to arrive no later than 31st January, 1986.

The winner will be the first correct entry drawn out of the Editor's hat (who said he had a big head?!).

All entries will be judged by the Editor of *QL User*, whose decision is final, and no correspondence will be entered into regarding the result.

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Sum of digits = _____

Name: _____

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QLU1/86

AI APPLICATIONS

A new series in which we begin where 'AI on the QL' left off — applications of AI theories. This month, Robert Alcock presents an automatic storyline generator — have you any other ideas?

```
100 REMark ***  Quill & Swoon - PLOT
 DESIGNER  ***
110 REMark         ***  By Robert Alc
ock  ***
120 REMark
130 REMark Title nouns
140 DATA "Romance","Love","Conflict"
,"Meeting","Passion"
150 DATA "Destiny","Intrigue","Fatef
ul Meeting","Chance Encounter","Emot
ion"
160 RESTORE 140
170 RAND=RND(1 TO 10)
180 FOR A=1 TO RAND
190 READ Titlenoun$
200 NEXT A
210 REMark
220 REMark Nationalities, national a
djectives and articles
230 DATA "Australia","Switzerland","
Austria","Scotland","Sweden"
240 DATA "Australian","Swiss","Austr
ian","Scottish","Swedish"
250 DATA "an","a","an","a","a"
260 RESTORE 240
270 RAND=RND(1 TO 5)
280 FOR A=1 TO RAND
290 READ MainNatAdj$
300 NEXT A
310 RESTORE 230
320 FOR A=1 TO RAND
330 READ MainNat$
340 NEXT A
350 RESTORE 250
360 FOR A=1 TO RAND
370 READ MainNatArt$
380 NEXT A
390 RESTORE 240
400 RAND=RND(1 TO 5)
410 FOR A=1 TO RAND
420 READ SecondNatAdj$
430 NEXT A
440 RESTORE 250
450 FOR A=1 TO RAND
460 READ SecondNatArt$
470 NEXT A
480 REMark
490 REMark Hero's names
500 DATA "Harry","Edward","Bill","Th
eo","Philip"
510 RESTORE 500
520 RAND=RND(1 TO 5)
530 FOR A=1 TO RAND
540 READ Heroname$
550 NEXT A
560 REMark
570 REMark Villain's names
580 DATA "Boris","Ivan","Sebastian",
"Jules","Kemal"
590 RESTORE 580
600 RAND=RND(1 TO 5)
610 FOR A=1 TO RAND
620 READ Vilname$
630 NEXT A
640 REMark
650 REMark Girl's names
660 DATA "Sylvia","Joanna","Victoria
","Alicia","Fennella"
670 RESTORE 660
680 RAND=RND(1 TO 5)
690 FOR A=1 TO RAND
700 READ Girlname$
710 NEXT A
720 REMark
730 REMark Father's names
740 DATA "Sir","Lord","Duke","Earl",
"Marqius"
750 DATA "Beauchamp","Montague","Bod
eley","Marjoribanks","Cholmondley"
760 RESTORE 740
770 RAND=RND(1 TO 5)
780 FOR A=1 TO RAND
790 READ Dadtitle$
800 NEXT A
810 RESTORE 750
820 RAND=RND(1 TO 5)
830 FOR A=1 TO RAND
840 READ Dadname$
850 NEXT A
860 Dadname$=Dadtitle$ & " " & Dadna
me$
870 REMark
880 REMark Locations,articles and pr
epositions
890 DATA "ski lodge","chateau","mans
ion","hospital","beach"
900 DATA "a","a","a","a","a"
910 DATA "at","at","at","in","on"
920 RESTORE 890
930 RAND=RND(1 TO 5)
940 IF RAND=5 AND MainNat$="Switzerl
and" THEN GO TO 930
950 IF RAND=2 AND MainNat$="Australi
a" THEN GO TO 930
960 FOR A=1 TO RAND
970 READ MainLoc$
980 NEXT A
990 RESTORE 900
1000 FOR A=1 TO RAND
1010 READ MainLocArt$
1020 NEXT A
1030 RESTORE 910
1040 FOR A=1 TO RAND
1050 READ MainLocPrep$
1060 NEXT A
1070 RAND=RND(1 TO 5)
1080 RESTORE 890
1090 IF RAND=5 AND SecondNatAdj$="Sw
iss" THEN GO TO 1070
1100 IF RAND=2 AND SecondNatAdj$="Au
stralian" THEN GO TO 1070
1110 FOR A=1 TO RAND
1120 READ SecondLoc$
1130 NEXT A
1140 IF SecondNatAdj$=MainNatAdj$ AN
D SecondLoc$=MainLoc$ THEN GO TO 107
0
1150 REMark
1160 REMark Hero's profession, artic
le
1170 DATA "doctor","struggling artis
t","novelist","racing driver","skier
"
1180 DATA "a","a","a","a","a"
1190 RAND=RND(1  TO 5)
1200 RESTORE 1170
1210 FOR A=1 TO RAND
1220 READ Heroprof$
1230 NEXT A
1240 RESTORE 1180
1250 FOR A=1 TO RAND
1260 READ HeroprofArt$
1270 NEXT A
1280 Heroprof$=HeroprofArt$ & " " &
Heroprof$
1290 REMark
1300 REMark Girl's profession, artic
le
1310 DATA "secretary","student","nur
se","tennis player","fashion designe
r"
1320 DATA "a","a","a","a","a"
1330 RAND=RND(1 TO 5)
1340 RESTORE 1310
1350 FOR A=1 TO RAND
1360 READ Girlprof$
1370 NEXT A
1380 RESTORE 1320
1390 FOR A=1 TO RAND
1400 READ GirlprofArt$
1410 NEXT A
1420 Girlprof$=GirlprofArt$ & " " &
Girlprof$
1430 REMark
1440 REMark Villian's profession, ar
ticle, adjective
1450 DATA "villanous","scheming","si
nister","French","American"
1460 DATA "a","a","a","a","an"
1470 DATA "tycoon","millionaire","di
amond smuggler","executive","gangste
r"
1480 RAND=RND(1 TO 5)
1490 RESTORE 1450
1500 FOR A=1 TO RAND
1510 READ VilAdj$
1520 NEXT A
1530 RESTORE 1460
1540 FOR A=1 TO RAND
1550 READ VilAdjArt$
1560 NEXT A
1570 RAND=RND(1 TO 5)
1580 RESTORE 1470
1590 FOR A=1 TO RAND
1600 READ Vilprof$
1610 NEXT A
1620 Vilprof$=VilAdjArt$ & " " & Vil
Adj$ & " " & Vilprof$
1630 REMark
1640 REMark Verb at end
1650 DATA "triumphs","conquers all",
"breaks all barriers","unites them",
"moves the earth"
1660 RAND=RND(1 TO 5)
1670 RESTORE 1650
1680 FOR A=1 TO RAND
1690 READ EndVerb$
1700 NEXT A
1710 REMark
1720 REMark Verb, adjective of disli
ke
1730 DATA "loathe","dislike","hate",
"despise","abhor"
1740 DATA "very much","intensely","v
ehemently","with all their hearts","
totally"
1750 RAND=RND(1 TO 5)
1760 RESTORE 1730
1770 FOR A=1 TO RAND
1780 READ HateVerb$
1790 NEXT A
1800 RAND=RND(1 TO 5)
1810 RESTORE 1740
1820 FOR A=1 TO RAND
1830 READ HateAdj$
1840 NEXT A
1850 REMark
1860 RAND=RND(1 TO 2)
1870 REMark
1880 REMark Now print the synopsis..
.
1890 REMark
1900 MODE 4
1910 WINDOW 512,256,0,0
1920 PAPER 0 : CLS
1930 BORDER 25
1940 PRINT Titlenoun$ ! MainLocPrep$
 ! "the" ! MainNatAdj$ ! MainLoc$
1950 PRINT "by Q. L. Heartland"
1960 PRINT
1970 PRINT "(Quill & Swoon MCMLXXXV)
"
1980 PRINT
1990 PRINT Heroname$;"," ! Heroprof$
;"," ! "and" ! Girlname$;"," ! Girlp
rof$;","
2000 PRINT "meet" ! MainLocPrep$ ! M
ainLocArt$ ! MainLoc$ ! "in" ! MainN
at$;"."
2010 PRINT "They" ! HateVerb$ ! "eac
h other" ! HateAdj$;"."
2020 PRINT "But when" ! Heroname$ !
"saves" ! Girlname$ ! "from" ! Vilna
me$;","
2030 PRINT Vilprof$;"," ! "they find
 they"
2040 PRINT "love each other after al
l."
2050 PRINT Dadname$;", father of ";
2060 IF RAND = 2 THEN PRINT Heroname
$; : ELSE PRINT Girlname$;
2070 PRINT ", refuses to let them ma
rry,"
2080 PRINT "but they escape to" ! Se
condNatArt$ ! SecondNatAdj$ ! Second
Loc$;","
2090 PRINT "where their love finally
" ! EndVerb$;"."
2100 PRINT
2110 PRINT
2120 PRINT "Press <F1> for the next
thrilling installment... "
2130 another=CODE(INKEY$(-1))
2140 IF another=232 THEN GO TO 100
2150 STOP
```

THE P+R:O=G<S

This is the page we hand over to you. So, if you've a program that is worthy of consideration, send it to 'The Progs', QL User, Priory Court, 30-32 Farringdon Lane, London EC1R 3AU. We pay for everything published at the usual rates.

Froggy — Part 2

Tony Day

For those who had the patience to type in Part 1 from our December '85 edition, here's the concluding part. For some reason we called the last part number 2 in the listing, but the resulting files should be OK.

Once you've typed in and run both parts (1 & 2), you should have two programs on microdrive called froggy1 and froggy2. To run the whole program type in the following line: **MODE 8:d=RESPR(15000): LBYTES mdv1_froggy1,d: LBYTES mdv1_froggy2,d+6500: CALL d**

Alternatively, you could enter the lines one by one as a 'boot' program and use that to run the two sections.

```
100 REMark **** Part1 QL Froggy  ****
110 REMark **** For QL User:A Day ****
120 DIM array(5):address=RESPR(6500)
130 start=address:CLS:CLS£0:RESTORE :lin=1000
140 READ nwords:PRINT lin
150 IF nwords<=0 THEN PRINT"Load complete":SBYTES mdv2_froggy1
,start,6500:STOP
160 csum=0:FOR i=0 TO nwords-1:READ array(i):csum=csum+array(i
):NEXT i
170 READ csum2:IF csum<>csum2 THEN PRINT"Checksum error at lin
e ";lin:PRINT"Correct checksum",csum:PRINT"Line of data":FOR i
=0 TO nwords-1:PRINT,array(i);",";:NEXT i:STOP
180 FOR i=0 TO nwords-1:POKE_W address,array(i):address=addres
s+2:NEXT i
190 lin=lin+10:GO TO 140
1000 DATA 6,24576,2860,18002,20295,18265,11822,95820
1010 DATA 6,11843,20304,22866,18759,18516,8257,100545
1020 DATA 6,11859,11844,16729,8241,14648,13568,76889
1030 DATA 6,21061,16708,22875,23387,23387,19450,126868
1040 DATA 6,-12,8316,2,9772,31241,4629,53948
1050 DATA 6,-28100,54,18663,-1,24832,2192,17640
1060 DATA 6,19679,-1,22664,21133,20941,-24,84392
1070 DATA 6,20085,23622,21071,18247,22876,23622,129523
1080 DATA 6,21071,18247,22876,16448,16448,16448,111538
1090 DATA 6,16448,16448,16450,22848,16448,21583,110225
1100 DATA 6,20057,16452,16729,16448,16448,16448,102582
1110 DATA 6,16448,16448,14143,15931,16448,24832,104250
1120 DATA 6,6276,19450,-62,31238,8316,2,65220
1130 DATA 6,11056,31751,29184,4629,-28100,54,48574
1140 DATA 6,18663,-1,24832,2088,19679,-1,65260
1150 DATA 6,22664,21133,20942,-24,-17860,6,46861
1160 DATA 6,26118,-28164,0,1535,-11780,0,-12291
1170 DATA 6,1504,20941,-50,20085,2,14504,56986
1180 DATA 6,2,14504,0,2,26024,18663,59195
1190 DATA 6,-1,24832,6188,19962,-24,11452,62409
1200 DATA 6,2,14504,11644,2,14504,4,40660
1210 DATA 6,15740,0,8,11644,2,26024,53418
1220 DATA 6,10,29184,30212,19962,460,8316,88144
1230 DATA 6,2,4758,30740,4630,-28100,54,12084
1240 DATA 6,18663,-1,24832,1968,19679,-1,65140
1250 DATA 6,21128,18663,-1,24832,1954,19679,86255
1260 DATA 6,-1,22152,21134,20940,-38,-11780,52407
1270 DATA 6,0,1452,20939,-50,31241,8316,61898
1280 DATA 6,2,27689,29224,18663,-1,24832,100409
1290 DATA 6,1914,19679,-1,22664,20941,-16,65181
1300 DATA 6,29184,8316,2,14888,31747,31241,115378
1310 DATA 6,18663,-1,24832,1884,19679,-1,65056
1320 DATA 6,22664,20993,20941,-18,-11780,0,52800
1330 DATA 6,2392,20942,-30,19962,-192,11606,54680
1340 DATA 6,4,29185,18426,446,9916,2305,60282
1350 DATA 6,0,17003,4,5953,6,6012,28978
1360 DATA 6,2,7,28689,20033,19962,-230,68463
1370 DATA 6,-19908,64,26368,446,-19908,16,-12922
1380 DATA 6,26168,21038,8,22678,3118,10,73020
1390 DATA 6,8,26368,404,3118,20,8,29926
1400 DATA 6,26368,394,3118,30,8,26368,56286
1410 DATA 6,384,3118,40,8,26186,7548,37284
1420 DATA 6,0,8,1174,0,7336,-19908,-11390
1430 DATA 6.2.26168.21294.8,22934,3118,73524
1440 DATA 6,9,8,26368,352,3118,19,29874
1450 DATA 6,8,26368,342,3118,29,8,29873
1460 DATA 6,26368,332,3118,255,8,26124,56205
1470 DATA 6,7548,39,8,1686,0,7336,16617
1480 DATA 6,10838,10350,4,10428,0,0,31620
1490 DATA 6,-9732,0,128,10428,0,0,824
1500 DATA 6,10428,0,0,-9732,0,1792,2488
1510 DATA 6,10428,0,0,-9732,0,128,824
1520 DATA 6,10428,0,0,15036,-21846,15228,18846
1530 DATA 6,-21846,2,-9220,0,128,15036,-15900
1540 DATA 6,-21846,15228,-21846,2,-9220,0,-37682
1550 DATA 6,1792,15036,-21846,15228,-21846,2,-11634
1560 DATA 6,-9220,0,128,15036,-21846,15228,-674
1570 DATA 6,-21846,2,13372,15000,20938,-2,27464
1580 DATA 6,24576,-296,18002,20295,18265,11822,92664
1590 DATA 6,11843,20304,22866,18759,18516,8257,100545
1600 DATA 6,11859,11844,16729,8241,14648,13568,76889
1610 DATA 6,16448,20037,22336,21583,20544,21573,122521
1620 DATA 6,20032,21315,20306,17728,16448,16478,112307
1630 DATA 6,24158,24158,24158,24158,24158,24158,144948
1640 DATA 6,24158,24158,16448,16448,16448,16448,114108
1650 DATA 6,16448,16448,16448,16448,16448,16448,98688
1660 DATA 6,16448,16453,20052,17746,16473,20309,107481
1670 DATA 6,21056,20033,19781,16469,21321,20039,118699
1680 DATA 6,19525,18004,16466,18759,18516,16449,107719
1690 DATA 6,20036,16467,20545,17221,23296,30728,128293
1700 DATA 6,9788,7,-24288,20939,-2,20940,27384
1710 DATA 6,-12,19679,-1,20085,0,0,39751
1720 DATA 6,0,0,0,0,0,0,0
1730 DATA 6,1686,0,2392,24576,-308,1174,29520
1740 DATA 6,0,2392,24576,-318,8302,10,34962
1750 DATA 6,21128,4654,8,18663,-1,24832,69284
1760 DATA 6,1350,19679,-1,22702,10,21038,64778
1770 DATA 6,9,13372,20000,20938,-2,19450,73767
1780 DATA 6,28,30720,6190,9,21252,-9276,48923
1790 DATA 6,6785,3118,10,9,26504,24576,61002
1800 DATA 6,-384,0,2827,3084,3341,3598,12466
1810 DATA 6,3855,19450,954,19962,460,18426,63107
1820 DATA 6,566,-10244,0,144,30217,10773,31456
1830 DATA 6,11286,-17786,28528,24832,-778,9219,55301
1840 DATA 6,10242,19962,428,-8708,0,32,21956
1850 DATA 6,11630,4,8,22926,20940,-10,55498
1860 DATA 6,11589,8,9291,10091,18,36,31033
1870 DATA 6,10091,22,40,10091,26,44,20314
1880 DATA 6,10091,30,48,14187,34,52,24442
1890 DATA 6,-26628,0,18,20938,-38,18938,13228
1900 DATA 6,844,10068,48,14188,4,52,25204
1910 DATA 6,18938,-130,10068,36,10092,4,39008
1920 DATA 6,40,14188,8,44,24582,22670,61532
1930 DATA 6,20939,-124,20085,4363,5903,2585,53751
1940 DATA 6,8207,7168,8316,2,14380,18663,56736
1950 DATA 6,-1,24832,5900,19679,-1,29184,79593
1960 DATA 6,30728,17402,-34,4625,21129,9288,83138
1970 DATA 6,31247,9404,85,85,-10756,0,30065
1980 DATA 6,128,20941,-14,18663,-1,24832,64549
1990 DATA 6,1074,19679,-1,22664,31746,10812,85974
2000 DATA 6,0,-10536,20941,-2,20942,-12,31333
2010 DATA 6,20940,-56,31754,10812,0,-15536,47914
2020 DATA 6,20941,-2,20942,-12,20085,2568,64522
2030 DATA 6,0,-21846,15420,-536,3,-22001,-28960
2040 DATA 6,256,2568,0,-21846,15420,2560,-1042
2050 DATA 6,10,0,256,2568,0,-21846,-19012
2060 DATA 6,-1281,256,-18421,9215,256,8316,-1659
2070 DATA 6,2,30620,18938,28,30720,6164,86472
2080 DATA 6,-11836,31242,12476,0,-11780,0,20102
2090 DATA 6,128,20941,-12,20085,0,14352,55494
2100 DATA 6,4096,0,0,0,0,0,4096
2110 DATA 6,0,0,0,18663,-1,29185,47847
2120 DATA 6,18426,-24,9916,2305,0,17003,47626
2130 DATA 6,4,5953,6,6012,2,7,11984
2140 DATA 6,28689,20033,-19908,64,26332,19679,74889
2150 DATA 6,-1,20085,24832,5034,17402,106,67458
2160 DATA 6,8316,2,6680,29184,30732,29713,104627
2170 DATA 6,4625,18663,-1,24832,850,19679,68648
2180 DATA 6,-1,21129,22664,20938,-20,-11780,52930
2190 DATA 6,0,1464,20940,-32,28672,20085,71129
2200 DATA 6,0,1000,0,900,0,800,2700
2210 DATA 6,0,700,0,600,0,500,1800
2220 DATA 6,0,400,0,300,0,200,900
2230 DATA 6,0,100,0,0,0,0,100
2240 DATA 6,0,0,0,0,2570,7705,10275
2250 DATA 6,6666,7695,6154,7437,6428,3869,38249
2260 DATA 6,2570,2570,10280,10280,10280,10280,46260
2270 DATA 6,10280,10280,10280,2570,2570,2570,38550
2280 DATA 6,2570,2570,2570,2570,2570,2570,15420
2290 DATA 6,2570,4124,6417,4387,9509,9509,36516
2300 DATA 6,9509,0,256,0,4124,6417,20306
2310 DATA 6,4387,9509,9509,9509,0,9,32923
2320 DATA 6,0,4124,6417,4387,9509,9509,33946
2330 DATA 6,9509,0,8,0,4124,6417,20058
2340 DATA 6,4387,9509,9509,9509,0,7,32921
2350 DATA 6,0,4124,6417,4387,9509,9509,33946
2360 DATA 6,9509,0,6,0,4124,6417,20056
2370 DATA 6,4387,9509,9509,9509,0,5,32919
2380 DATA 6,0,4124,6417,4387,9509,9509,33946
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2400 DATA 6,4387,9509,9509,9509,0,3,32917
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2420 DATA 6,9509,0,2,0,4124,6417,20052
2430 DATA 6,4387,9509,9509,9509,0,1,32915
2440 DATA 6,0,0,0,0,0,0,0
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2470 DATA 6,0,0,0,0,0,0,0
2480 DATA 6,0,0,0,0,0,0,0
2490 DATA 6,0,0,0,0,0,0,0
2500 DATA 6,0,0,0,0,0,0,0
2510 DATA 6,0,0,0,0,0,0,0
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2530 DATA 6,10,5,27914,1068,10,5,29012
2540 DATA 6,21036,4,3116,10,4,27914,52084
2550 DATA 6,1068,10,4,21036,3,3116,25237
2560 DATA 6,10,3,27914,1068,10,3,29008
2570 DATA 6,21036,2,3116,10,2,27914,52080
2580 DATA 6,1068,10,2,21036,1,3116,25233
2590 DATA 6,10,1,27912,1068,10,1,29002
2600 DATA 6,21012,20085,0,0,0,0,41097
2610 DATA 6,0,18663,-1,10876,2,32088,61628
2620 DATA 6,31247,15036,0,21645,20941,-8,88861
2630 DATA 6,30720,18938,42,6164,-18372,1,37493
2640 DATA 6,26394,21764,8316,2,30681,18663,105820
2650 DATA 6,2176,24832,2960,19679,272,20616,70535
2660 DATA 6,20940,-16,19679,-1,20085,768,61455
2670 DATA 6,0,18938,840,6332,26,6524,32660
2680 DATA 6,11,2,10620,2,26940,4,37579
2690 DATA 6,10620,2,26940,8,6524,11,44105
2700 DATA 6,12,20085,7437,6428,3850,0,37812
2710 DATA 6,0,0,2570,2570,2578,4881,12599
2720 DATA 6,4618,0,256,0,7699,5903,18476
2730 DATA 6,2602,10537,10537,10537,10537,10537,55287
2740 DATA 6,10537,11018,2570,2570,2570,2570,31835
2750 DATA 6,10537,10537,10537,10537,10539,17402,70089
2760 DATA 6,-68,29723,29184,8316,2,29064,96221
2770 DATA 6,4625,18663,-1,24832,130,19679,67928
2780 DATA 6,-1,21129,22664,20938,-20,28672,93382
2790 DATA 6,20085,17402,-80,29184,29723,8316,104630
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2910 DATA 6,-18,28672,20085,18663,-1,18938,86339
2920 DATA 6,7888,19450,7874,19962,174,7316,62664
2930 DATA 6,6804,31319,21132,6484,-1,20941,86679
2940 DATA 6,-8,6485,-1,18938,7944,19450,52808
2950 DATA 6,7844,19962,144,7316,6804,10812,52882
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3130 DATA 6,184,8316,2,10378,24832,140,43852
3140 DATA 6,8316,2,12532,24832,164,8316,54162
3150 DATA 6,2,14474,24952,30720,19962,-100,90010
3160 DATA 6,6166,10876,2,6262,24904,30720,78930
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3320 DATA 6,31745,31245,19450,2298,13330,-15108,82960
3330 DATA 6,128,-9278,30735,12040,30209,8341,72175
3340 DATA 6,22664,22669,20939,-8,-11780,0,54484
3350 DATA 6,120,20940,-20,8287,20616,21642,71585
3360 DATA 6,20941,-46,-11780,0,1936,20942,31993
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3620 DATA 6,26368,1494,3093,4,26368,1486,58813
3630 DATA 6,3093,1,26368,1456,3093,3,34014
3640 DATA 6,26368,1448,3093,5,26368,1440,58722
3650 DATA 6,18426,1420,29185,9916,2305,0,61252
3660 DATA 6,17003,4,5953,6,6012,2,28980
3670 DATA 6,7,28689,20033,19450,-364,18426,86241
3680 DATA 6,-732,2049,3,26380,18663,-1,46362
3690 DATA 6,24832,-1892,19679,-1,2049,7,44674
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3720 DATA 6,26112,1314,28672,19450,-416,8277,83409
3730 DATA 6,18938,-426,3220,2,6408,26410,54552
3740 DATA 6,3220,2,8560,26402,3220,2,41406
3750 DATA 6,10504,26394,3220,2,12656,26386,79162
3760 DATA 6,3220,2,14600,26378,18426,-838,61788
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3930 DATA 6,26368,452,-18372,7,26368,642,35465
3940 DATA 6,-18372,8,26368,634,-18372,9,-9725
3950 DATA 6,26368,626,-18372,10,26368,618,35618
3960 DATA 6,-18372,6,26368,644,18663,-1,27308
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4000 DATA 6,1,21012,18663,-1,24832,-1676,62831
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4110 DATA 6,3116,0,1,26152,6508,2,35779
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4130 DATA 6,18426,-2524,28689,20033,19679,-1,84302
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4160 DATA 6,3093,0,26172,18663,-1,18663,66590
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4190 DATA 6,-2278,19450,-1788,11116,12,22,26534
4200 DATA 6,15212,16,26,19679,-1,19679,54611
4210 DATA 6,-1,24576,-970,28672,29184,29696,111157
4220 DATA 6,30208,30720,31232,31744,11900,0,135804
4230 DATA 6,0,11388,0,0,10876,0,22264
4240 DATA 6,0,9340,0,0,9852,0,19192
4250 DATA 6,0,8828,0,0,8316,0,17144
4260 DATA 6,0,10364,0,0,24576,-842,34098
4270 DATA 6,21645,3156,10816,26368,304,3157,65446
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4290 DATA 6,23693,3156,10816,26368,280,3157,67470
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4340 DATA 6,2,3360,3093,12,26368,414,33249
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4370 DATA 6,26368,386,8316,2,3416,3093,41581
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4390 DATA 6,3093,48,26368,358,24576,-518,53925
4400 DATA 6,18663,-1,18938,-2768,21780,18663,75275
4410 DATA 6,-1,24832,-2814,19679,-1,18426,60121
4420 DATA 6,-2180,22059,5,18426,-2182,22163,58291
4430 DATA 6,18663,-1,24832,-2292,24832,-1900,64134
4440 DATA 6,10300,0,10000,20940,-2,19679,60917
4450 DATA 6,-1,18938,-2826,3092,0,26300,45503
4460 DATA 6,6332,56,6508,2,1,19679,32578
4470 DATA 6,-1,20085,17914,678,31279,13500,83455
4480 DATA 6,0,21642,20941,-8,23693,3156,69424
4490 DATA 6,0,26156,3157,0,26150,24576,80039
4500 DATA 6,-640,17914,644,31279,13500,-21846,40851
4510 DATA 6,21642,20941,-8,23693,3156,-21846,47578
4520 DATA 6,26122,3157,-21846,26116,24576,-674,57451
4530 DATA 6,19450,-2236,18663,-1,18426,-2980,51322
4540 DATA 6,28689,20033,19679,-1,21269,30724,120393
4550 DATA 6,10812,0,-15536,20941,-2,20940,37155
4560 DATA 6,-12,17402,-1424,8273,10312,17402,51953
4570 DATA 6,-1434,6161,-18372,1,26114,21896,34366
4580 DATA 6,-18372,3,26114,21896,-18372,5,11274
4590 DATA 6,26114,21896,-18372,2,26114,21640,77394
4600 DATA 6,-18372,4,26114,21640,-17924,2,11464
4610 DATA 6,6408,26426,-17924,2,8560,26436,49908
4620 DATA 6,-17924,2,10504,26410,-17924,2,1070
4630 DATA 6,12656,26420,-17924,2,14600,26394,62148
4640 DATA 6,24832,654,19450,-3056,6844,56,48780
4650 DATA 6,7021,2,1,24576,-604,24576,55572
4660 DATA 6,-608,18938,452,31755,14524,515,65576
4670 DATA 6,20620,20942,-8,24788,18938,434,85714
4680 DATA 6,23692,31755,14524,-32576,20620,20942,78957
4690 DATA 6,-8,24768,18663,-1,24832,618,68872
4700 DATA 6,19450,-2438,21013,19450,-2524,23085,78036
4710 DATA 6,4,1709,0,50,6,19679,21448
4720 DATA 6,-1,24832,-388,24576,-688,21640,69971
4730 DATA 6,24576,-1050,21896,24576,-1056,3117,72059
4740 DATA 6,10,2,28160,-1250,21037,2,47961
4750 DATA 6,1709,0,2048,4,5820,2,9583
4760 DATA 6,24576,-1246,3117,1,2,27904,54354
4770 DATA 6,-1272,21293,2,1197,0,2048,23268
4780 DATA 6,4,5820,2,18938,-2620,21036,43180
4790 DATA 6,5,21164,6,24576,-1288,3093,47556
4800 DATA 6,2,27904,-1304,21781,22957,4,71344
4810 DATA 6,5820,2,24576,-1310,3093,50,32231
4820 DATA 6,28160,-1318,21525,22701,4,5820,76892
4830 DATA 6,2,24576,-1332,0,0,0,23246
4840 DATA 6,0,0,0,0,0,0,3117,3117
4850 DATA 6,1,-2,27904,-1446,21293,-2,47748
4860 DATA 6,21933,2,24576,-1458,3117,51,48221
4870 DATA 6,-2,28160,-1468,21037,-2,21677,69402
4880 DATA 6,2,24576,-1480,18663,-1,19450,61210
4890 DATA 6,180,30731,15036,515,20621,20940,88023
4900 DATA 6,-8,19679,-1,24576,-1304,18663,61605
4910 DATA 6,-1,19450,152,30731,15228,-32576,32984
4920 DATA 6,6,20621,20940,-10,19679,-1,61235
4930 DATA 6,24576,-1334,18002,20295,18265,11822,91626
4940 DATA 6,11843,20304,22866,18759,18516,8257,100545
4950 DATA 6,11859,11844,16729,8241,14648,13568,76889
4960 DATA 6,255,-32196,-32196,255,764,2800,-60318
4970 DATA 6,-24561,-32705,764,2800,-24561,-32705,-110968
4980 DATA 6,255,-22016,-22016,255,255,10944,-32323
4990 DATA 6,-22525,255,255,10944,-22525,255,-33341
5000 DATA 6,255,-22016,-22016,255,764,-22525,-65283
5010 DATA 6,10944,-32705,764,-32705,764,-32705,-85643
5020 DATA 6,255,-24561,2800,255,255,10435,-10561
5030 DATA 6,10435,255,255,-24561,2800,255,-10561
5040 DATA 6,0,0,0,0,0,0,0,0
5050 DATA 6,0,0,0,0,0,0,0,0
5060 DATA 6,0,0,0,0,0,0,0,0
5070 DATA 6,0,0,0,0,0,0,0,0
5080 DATA 6,0,0,0,0,0,0,0,0
5090 DATA 6,0,0,0,0,0,0,0,0
5100 DATA 6,0,0,0,0,0,0,0,0
5110 DATA 6,0,0,0,0,0,0,0,0
5120 DATA 6,31243,17402,-100,9800,30721,8851,97917
5130 DATA 6,22601,22603,20940,-8,-10244,0,55892
5140 DATA 6,120,20941,-20,17402,-224,31243,69462
5150 DATA 6,30723,4625,5136,-31743,4226,21128,34095
5160 DATA 6,21129,4625,5136,-15870,4225,21128,40373
5170 DATA 6,21129,20940,-26,-11780,0,120,30383
5180 DATA 6,20941,-38,28672,20085,31243,17402,118305
5190 DATA 6,-180,30721,8337,22601,22600,20940,105019
5200 DATA 6,-8,-11780,0,120,20941,-20,9253
5210 DATA 6,28672,20085,17402,1110,31765,31233,130267
5220 DATA 6,8337,22665,22664,20941,-8,-11780,62819
5230 DATA 6,0,120,20942,-20,28672,20085,69799
5240 DATA 6,-22016,-22016,-22016,-22016,-22016,-22016,-132096
5250 DATA 6,-22016,-22014,-22008,-21984,-22016,-21888,-131926
5260 DATA 6,-22016,-22016,-22016,-22016,-22016,-22016,-132096
5270 DATA 6,-21984,-22016,-22016,-22016,-22016,-22016,-132064
5280 DATA 6,-22016,-21888,-22016,-22016,-22016,-22016,-131968
5290 DATA 6,-21888,-22008,-22016,-22016,-22014,-22016,-131958
5300 DATA 6,-22008,-22008,-22016,-22015,-22016,-22016,-132079
5310 DATA 6,-22014,-22523,-22016,-21888,-22016,-22395,-132852
5320 DATA 6,-22016,-22016,-22016,-22523,-22016,-22008,-132595
5330 DATA 6,-22008,-22523,-22008,-22016,-22016,-22523,-133094
5340 DATA 6,-22016,-22016,-22016,-22523,-22016,-22016,-132603
5350 DATA 6,-22016,-22016,-22016,-21888,-22008,-22008,-131952
5360 DATA 6,-22016,-22016,-22016,-22016,-21984,-21984,-132032
5370 DATA 6,-22016,-22016,-22016,-22016,-22016,-22008,-132088
5380 DATA 6,-22016,-22016,-22016,-22016,-22016,-22016,-132096
5390 DATA 6,-22008,-22016,-22008,-22016,-22016,-22016,-132080
5400 DATA 6,-22016,-22008,-22014,-22016,-21952,-22016,-132022
5410 DATA 6,-22016,-22015,10832,-22016,-22016,-22523,-99754
5420 DATA 6,10832,-22016,-22016,-22523,10832,-22008,-66899
5430 DATA 6,-22016,-22523,10832,-22016,-22016,-22523,-100262
5440 DATA 6,10832,-21888,-22008,-22523,10832,-22016,-66771
5450 DATA 6,-22016,-22523,-22016,-22016,-22016,-22016,-132603
5460 DATA 6,-22016,-21888,-22008,-22008,-22016,-22016,-131952
5470 DATA 6,-22016,-22016,-21984,-21984,-22016,-22016,-132032
5480 DATA 6,-22016,-22016,-22016,-22008,-22016,-22016,-132088
5490 DATA 6,-22016,-22016,-22016,-22016,-22008,-22016,-132088
5500 DATA 6,-22008,-22016,-22016,-22016,-22016,-22008,-132080
5510 DATA 6,-22014,-22016,-21952,-22016,-22016,-22016,-132030
5520 DATA 6,10832,-22016,-22016,-22008,10832,-22016,-66392
5530 DATA 6,-22016,-22016,10832,-22008,-22016,-22016,-99240
5540 DATA 6,10832,-22016,-22016,-22016,10832,-21888,-66272
5550 DATA 6,-22008,-22016,10832,-22016,-22016,-22016,-99240
5560 DATA 6,-22016,-22016,-22016,-22016,-22016,-22016,-132096
5570 DATA 6,-22016,-22014,-22008,-21984,-22016,-21888,-131926
5580 DATA 6,-22016,-22016,-22016,-22016,-22016,-22016,-132096
5590 DATA 6,-21984,-22016,-22016,-22016,-22016,-22016,-132064
5600 DATA 6,-22016,-21888,-22016,-22016,-22016,-22016,-131968
5610 DATA 6,-21888,-22008,-21931,-21931,-21931,-21931,-131620
5620 DATA 6,85,85,85,85,85,85,510
5630 DATA 6,85,85,85,85,85,85,510
5640 DATA 6,85,85,85,85,85,85,510
5650 DATA 6,85,85,85,85,85,85,510
5660 DATA 6,85,85,85,85,-22016,-22016,-43692
5670 DATA 6,-22016,-22523,-22016,-21888,-22008,-22523,-132974
5680 DATA 6,-21984,-22016,-22016,-22523,-22016,-21984,-132539
5690 DATA 6,-22016,-22523,-22016,-22016,-22016,-22523,-133110
5700 DATA 6,-22016,-22016,-22016,-22523,-22014,-22016,-132601
5710 DATA 6,-22008,-22523,-22016,-22016,-22016,-22523,-133102
```

```
5720 DATA 6,-22016,-22008,-22014,-22523,-22016,-22016,-132593
5730 DATA 6,-22016,-22523,-22016,-22016,-22016,-22523,-133110
5740 DATA 6,-22016,-22016,-22016,-24555,-22008,-22008,-134619
5750 DATA 6,-22016,-24555,-22016,-22016,-22008,-32683,-145294
5760 DATA 6,-22016,-22016,-22011,85,-21931,-21931,-109820
5770 DATA 6,-24491,85,85,85,85,85,-24066
5780 DATA 6,85,85,85,85,85,85,510
5790 DATA 6,85,85,85,85,85,85,510
5800 DATA 6,85,85,85,85,85,85,510
5810 DATA 6,85,85,85,85,85,85,510
5820 DATA 6,85,85,85,85,85,85,510
5830 DATA 6,85,85,85,85,85,85,510
5840 DATA 6,85,85,85,85,85,85,510
5850 DATA 6,85,85,85,85,85,85,510
5860 DATA 6,85,85,85,85,85,85,510
5870 DATA 6,85,85,85,85,85,85,510
5880 DATA 6,10832,-22016,-22016,-22523,10832,-21888,-66779
5890 DATA 6,-22008,-22523,10832,-22016,-22016,-22523,-100254
5900 DATA 6,10832,-21984,-22016,-22523,10832,-22016,-66875
5910 DATA 6,-22016,-22523,10832,-22016,-22016,-22523,-100262
5920 DATA 6,10834,-22016,-22008,-22523,10832,-22016,-66897
5930 DATA 6,-22016,-22523,10832,-22008,-22014,-22523,-100252
5940 DATA 6,10832,-22016,-22016,-22523,10832,-22016,-66907
5950 DATA 6,-22016,-22523,2644,-22016,-22016,-24555,-110482
5960 DATA 6,2644,-22008,-22016,-24555,597,-22016,-87354
5970 DATA 6,-22008,-32683,85,-21936,-22011,85,-98468
5980 DATA 6,85,2645,-24491,85,10832,-22016,-32860
5990 DATA 6,-22016,-22016,10832,-22008,-22008,-22016,-99232
6000 DATA 6,10832,-22016,-22016,-22016,10832,-21984,-66368
6010 DATA 6,-22016,-22016,10832,-22016,-22016,-22016,-99248
6020 DATA 6,10832,-22016,-22016,-22016,10834,-22016,-66398
6030 DATA 6,-22008,-22016,10832,-22016,-22016,-22016,-99240
6040 DATA 6,10832,-22008,-22014,-22016,10832,-22016,-66390
6050 DATA 6,-22016,-22016,10832,-22016,-22016,-22016,-99248
6060 DATA 6,2644,-22016,-22016,-22016,2644,-22008,-82768
6070 DATA 6,-22016,-22016,597,-22016,-22008,-22016,-109475
6080 DATA 6,85,-21936,-22016,-22016,85,2645,-63153
6090 DATA 6,-21931,-21931,0,3,1,3,-43855
6100 DATA 6,1,3,2,0,3,1,10
6110 DATA 6,3,1,3,2,4,5,18
6120 DATA 6,6,5,6,5,7,4,33
6130 DATA 6,5,6,5,6,5,7,34
6140 DATA 6,85,-22016,-22016,85,80,-21824,-65606
6150 DATA 6,-22013,5,2639,10800,-22516,-24335,-55420
6160 DATA 6,10879,-30004,-24013,-22275,10364,2572,-52477
6170 DATA 6,-24528,10301,-24528,2572,-24528,2572,-58139
6180 DATA 6,-24528,2572,-24528,2572,-22016,-22016,-87944
6190 DATA 6,-22016,-22016,-21764,-22016,-22016,-21953,-131781
6200 DATA 6,-21761,-21761,-21761,-21761,-21953,-21761,-130758
6210 DATA 6,-21761,-21764,-22001,-21761,-21761,-21776,-130824
6220 DATA 6,-22013,-21761,-21761,-21824,-21776,-21761,-130896
6230 DATA 6,-21761,-22001,-21764,-21761,-21761,-21953,-131001
6240 DATA 6,-21761,-21953,-21764,-21761,-21761,-21824,-130824
6250 DATA 6,-22013,-21761,-21953,-21776,-22001,-21764,-131268
6260 DATA 6,-22001,-21764,-21953,-21776,-21761,-21764,-131019
6270 DATA 6,-21953,-21761,-21761,-32555,599,-21761,-119192
6280 DATA 6,85,85,85,85,8316,2,8658
6290 DATA 6,1928,8828,2,28680,30775,12988,83201
6300 DATA 6,-21761,12476,-21761,21577,21576,20940,33047
6310 DATA 6,-14,8316,2,1926,8828,2,19060
6320 DATA 6,2040,9788,0,209,12476,515,25028
6330 DATA 6,12988,-32576,-11268,0,128,-11780,-42508
6340 DATA 6,0,128,20939,-22,28672,20085,69802
6350 DATA 6,8316,2,0,10300,0,8192,26810
6360 DATA 6,8380,0,0,22600,20940,-10,51910
6370 DATA 6,28672,20085,8316,2,2056,30831,89962
6380 DATA 6,30235,8380,85,85,22664,20939,82388
6390 DATA 6,-10,-11780,0,16,20940,-22,9144
6400 DATA 6,28672,20085,-21846,-21846,-21846,-21846,-38627
6410 DATA 1,-21846,-21846
6420 DATA 1,-21846,-21846
6430 DATA 1,-21846,-21846
6440 DATA 1,-21846,-21846
6450 DATA -1
```

Pentathlete

A Didcock

At the risk of repeating ourselves (this is turning out to be a bit of an epic), we'll have one final attempt at putting the record straight.

The November listing of Pentathlete is correct, albeit a little confused. What happened is that we included a set-up screen within the listing that is not needed for running the game.

So, if you've typed in lines 1-32180, all you need to do is delete two segments for the program to run. These are at the beginning and end of the listing, that is; lines 1, 3, 4, 5, 6, 7 and all lines from 31999 to the end.

The final program should begin with **10 hiscore = 0** and end with **30000 DATA 5,1,6,4,3,2.** Hopefully this ends the Pentathlete saga — apologies for the muddle and December's 'half-attempt' to correct it (which is best ignored). We hope you can all now enjoy the game.

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GETN & GETS Allow you to edit variables on screen. MCUR Moves the cursor up down left or right. TAB Moves the cursor to the given column no (left or right). FONT Allows you to reset the font address. Makes user designed graphics possible. RMODE returns the current display mode. DUMP dumps 1 or more lines from the screen to the printer. BVAR returns address of Basic Variables. PLUS HI RES SCREEN DUMP to printer at the touch of a key.

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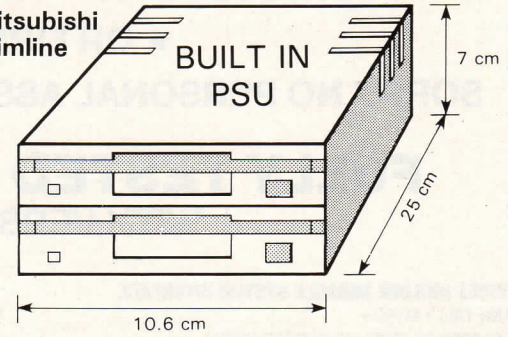

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- ★ Suppliers file
- ★ Cash/cheque receipt and matching
- ★ Record p.cash purchases and refunds
- ★ Invoice/credit note entry
- ★ Supplier outstanding invoices
- ★ Creditors report
- ★ Monthly transactions audit trial
- ★ Suppliers turnover report

IMPAACT NOMINAL LEDGER

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- ★ Trial balance
- ★ Profit and loss report
- ★ Balance sheet
- ★ Budget entry
- ★ Comparative budgets
- ★ Interface and update from sales & purchase ledgers

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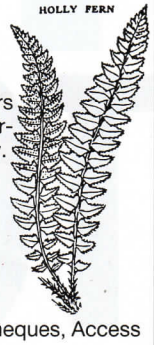

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TOOLKIT TOURNAMENT

Marcus Jeffery compares two QL Toolkits with some interesting results — striking similarities and very few differences.

Whatever the computer and however extensive the language and operating system, it never seems to have just the commands you really need. Given the flexibility of QL QDOS, it's a fairly simple matter to add your own extensions to SuperBasic, assuming you have the time and ability to program in 68000 machine code. The rest either have to make do with what they've got or invest in one of the excellent TOOLKIT packages available.

We decided to take a look at a couple of well-established toolkits. We also have details of a new extension package called Giga-Basic.

The first of the packages we examined is Super 'B', written by Adam Denning and marketed by HiSoft. We'll also be looking at the Qjump QL-Toolkit, written by Tony Tebby, and marketed by Sinclair Research, including some information on Tony's new toolkit.

TOOLS ON ROM

Place the cartridge into the microdrive, press F1 or F2 and go make a pot of team. Not so with Super 'B', which is supplied in the form of an EPROM, plugging into the ROM socket at the rear of the machine. This is far better than microdrive storage for this type of product, and it's unlikely that it will have to compete with any other ROMS, which tend to be languages, when you're using SuperBasic.

Figure 1 shows the additional commands available from Super 'B'. Though similar in many ways to the Qjump QL-Toolkit, Super 'B' contains far more extensive commands in the areas of screen graphics and general utilities. Having said this, it's difficult to understand the use of the bit-manipulation commands, though Adam Denning claims frequent use of them. The two linked-list functions are fairly redundant, being far too brief to be of any real use in list processing. The High Score Table games routines are quite novel, but I'm sure games programmers could manage to implement their own high score table, which is not time-critical, and would be far happier to see some more generally useful game routines.

A very similar package is the Qjump QL-Toolkit. *Figure 2* shows how much these two overlap. The Qjump product tends to concentrate far more on the file-handling and stream control features, rather than the more general and graphics features of Super 'B'. It also suffers from being supplied on microdrive, requiring loading, and reducing the amount of available RAM. Both of these packages are aimed at the more serious programmer, providing access to advanced QDOS features through SuperBasic. The choice between them is mainly up to the user's specific requirements. Probably the most useful additional command on the QL-Toolkit, missing from the HiSoft product, is the on-screen SuperBasic editor.

The story behind QL-Toolkit is that it was originally supplied to Sinclair (well over a year ago) for inclusion in updated QL ROMs. These should have been available by April 1985, but never materialised. Instead, the extensions were marketed as a toolkit, though actually obtaining copies isn't easy. Unless you're lucky enough to find a dealer selling them, the most likely course is to send for the toolkit via mail order, though this appears doubtful.

The good news is that Tony Tebby is nearing completion on Toolkit Version II, which will be marketed in Europe by Qsoft and in England by Care Electronics. This new version will be in a 16K ROM format, and should contain many extra commands. These include vastly increased file handling commands, an extended on-screen editor and PRINT_USING for fixed format output. There are also new commands, such as DO, which will execute a file of direct commands and a numeric/string array sort routine. It is hoped that the ROM version will be available by mid-December, and disk/Microdrive versions will follow early in 1986.

Finally, GigaBASIC is a new package of SuperBasic extensions from ABC Elektronic. Very different from the previous two toolkits. GigaBASIC is designed for the more general games and small business applications programmer. There are extensive sprite commands, allowing definition, saving and loading, moving, animation and sprite-to-sprite collision detection. In fact, the only feature which appears to be missing is sprite-to-background detection. In addition, there are a number of Mackintosh-style menu utilities. These allow for definition and placement of pull-down menus using either the cursor keys or mouse. In addition, there are also a number of more general commands, tending to overlap with the other toolkits, including fill-any-irregular shape, file handling, function key definition, digital/analogue clocks, an on-screen editor, Epson printer hard copy routine and fount definition.

A spin-off from the pull-down menus in this toolkit is a package called EASE (Easily Applicable System Environment), which is a complete desk-top environment, similar to ICE from Eidersoft.

All of these products can be recommended for use with the QL. The choice lies mainly with the user's applications. The new GigaBASIC extensions are ideal for users wanting to write their own games programs or menu-driven business packages, remembering that they'll only be for your own use, or anybody else with a copy of GigaBASIC. The more established toolkits are aimed at the more serious programmer, who has just found out that QDOS doesn't give all the necessary facilities for an advanced development environment.

FIGURE ONE: HISOFT SUPER 'B' EXTENSIONS

JOB CONTROL

ACJOB - Activate a job.
CJOB$ - Create a job.
DLEN - Return default data space length of file.
JOB - Return TRUE if job is present.
JOBS - Give details of present jobs.
KJOB - Kill a job.
PJOB - Set job priority.
RELJOB - Release a job from suspension.
SJOB - Suspend job for specified time/indefinitely.

MEMORY MANAGEMENT

ALCHP - Allocate space from Common Heap.
FREE - Return amount of free memory.
RECHP - Return space to Common Heap.
RERES - Release all Resident Procedure space.

MACHINE CODE

CHANID - Returns internal QDOS channel ID.
DUMP - Dump memory in hex. and ASCII.
QTRAP - Executes 68008 TRAP# instruction.

STREAM CONTROL

CONNECT - Connect input/ouput channels.
PTR - Set read/write position on given channel.
PTR_R - Add relative offset to read/write position.

SCREEN & GRAPHICS

CUR - Enable/disable cursor on given channel.
PXPOS - Return horizontal pixel position of cursor in window.
PXSIZE - Return number of horizontal pixels in window.
PYPOS - Return vertical pixel position of cursor in window.
PYSIZE - Return number of vertical pixels in window.
SETWIN - On-screen user definition of size and placement of window.
SSHOW - Show screen area previously SSAVEd.
SLOAD - As for SSHOW, but also releases Common Heap area used.
SSAVE - Save a screen rectangle to the Common Heap area.
UDG - Set fount addresses on given channel.
XPOS - Return horizontal character position of cursor in window.
XSIZE - Return number of horizontal characters in window.
YPOS - Return vertical character position of cursor in window.
YSIZE - Return number of vertical characters in window.

FILE HANDLING

EXT - Return length of file.
FREAD - Read from channel to buffer address.
FWRITE - Write to channel from buffer address.
HEADR - Read file header to buffer address.
HEADS - Set header on file.

GAMES ROUTINES

HIGHS - Display High Score Table.
SCORE - Enter score and name into High Score Table.
SETHIGH - Initialise High Score Table.

BASIC

LINK - Link item into linked list.
RESET - Perform a software Reset.
TRACE - Create SuperBASIC tracing job.
TROFF - Stop trace by suspending it.
TRON - Start trace by releasing it.
UNLINK - Remove item from linked list.

BIT MANIPULATION

AND_L - AND 32-bit integer.
OR_L - OR 32-bit integer.
EOR_L - Exclusive-OR 32-bit integer.
LSL_L - Left shift 32-bit integer.
LSL_W - Left shift lower 16 bits of 32-bit integer.
LSL_B - Left shift lower 8 bits of 32-bit integer.
LSR_L - Right shift 32-bit integer.
LSR_W - Right shift lower 16 bits of 32-bit integer.
LSR_B - Right shift lower 8 bits of 32-bit integer.
ROL_L - Left rotate 32-bit integer.
ROL_W - Left rotate lower 16 bits of 32-bit integer.
ROL_B - Left rotate lower 8 bits of 32-bit integer.
ROR_L - Right rotate 32-bit integer.
ROR_W - Right rotate lower 16 bits of 32-bit integer.
ROR_B - Right rotate lower 8 bits of 32-bit integer.

GENERAL

HEX - Convert hex. string to decimal.
HEX$ - Convert decimal to hex. string.
ICOPY - Intelligent copy of byte area between memory locations.
ICOPY_L - As for ICOPY, but for longwords.
ICOPY_W - As for ICOPY, but for words.
KEY - Allows function key programming.
REPORT - Print QDOS error message.

FIGURE TWO: QJUMP QL-TOOLKIT EXTENSIONS

JOB CONTROL

AJOB - Activate a job.
JOBS - Give details of present jobs.
JOB$ - Return name of job.
NXJOB - Get next job in tree.
OJOB - Get job owner
PJOB - Get job priority.
RJOB - Remove a job.
SPJOB - Set job priority.

MEMORY MANAGEMENT

ALCHP - Allocate space from Common Heap.
CLCHP - Clear space in Common Heap area.
FREE_MEM - Return amount of free memory.
RECHP - Release an area of the Common Heap.

MACHINE CODE & STREAM CONTROL

DATA_USE - Set directory default for data files.
EX,EW,ET - Extended EXEC and EXEC_W commands, allowing setting of input/output files and chains of jobs (filters) for stream control.
EX_DEF - Set default priority and buffer size between jobs.
PROG_USE - Set directory default for program files.

SCREEN & GRAPHICS

CHAR_INC - Set horizonatal and vertical spacing between characters.
CHAR_USE - Set character founts.
CURDIS - Disable cursor.
CURSEN - Enable cursor.
WMON - Reset windows (Monitor defaults).
WTV - Reset windows (TV defaults).

FILE HANDLING

BGET - Get bytes from channel.
BPUT - Put bytes to channel.
FDAT - Get program data space from header.
FLEN - Get file length from header.
FOPEN - Open file.
FOP_DIR - Open directory.
FOP_IN - Open file for input.
FOP_NEW - Open new file.
FOP_OVER - Open file, overwriting old one, if it exists.
FPOS - Returns current file position.
FTYP - Get file type from header.
GET - Get data from file using internal numeric/string format.
PUT - Put data to file using internal numeric/string format.
RENAME - Rename a file.
SPL - Spool a file.
SPL_USE - Set spool default output directory.
STAT - Print drive statistics.
TRUNCATE - Truncate a file to current position.
VIEW - Print a file.
WDEL - Delete files, with confirmation.
WDEL_F - Delete files.
WDIR - Print directory.
WSTAT - Print file statistics.

GENERAL

BIN - Convert binary-type string to decimal.
BIN$ - Convert decimal to binary string.
CDEC$ - As IDEC$, but inserts commas every three digits.
ED - On-screen editor.
FDEC$ - Convert decimal number to formatted string.
HEX - Convert hex. string to decimal.
HEX$ - Convert decimal to hex. string.
IDEC$ - As FDEC, but assumes value to be in least significant units.
PARTYP - Returns type of parameter in SuperBASIC procedure/function.
PARUSE - Returns usage of parameter in SuperBASIC procedure/function.

In addition, QL-Toolkit contains the following programs:

JOB FILTERS (for use with EX)

CCL - Concatenate line-based files.
CCT - Concatenates files.
CPY - Copy a file.
LNO - Adds line numbers to a file.
MORE - Copies file to screen window, with screen page prompts.
PAGE - Spilts file into pages.
UC - Convert file to upper-case.

MACHINE-CODE PROGRAMS

ALARM - Alarm clock.
CLOCK - Digital clock in window 0.
CLOCKH - Clock with hands (continuously drawn).
CLOCKN - Clock with hands (updated).
CLOCKS - Digital clock (fixed position).

SUPERBASIC PROGRAMS

FBACK - Fast backup of all files.
MBACK - Fast backup of preselected files.
PATCH - File patching utilty.
SBACK - Fast backup, with confirmation of each file.
UDC - User-defined character editor.

and Superscript and subscript founts (for use with CHAR_USE).

MICRODRIVE EXCHANGE

Each month, for a trial period, this column will contain details of readers' programs that we are able to offer on microdrive.

In return for a small administration charge (per program – including a royalty for the author), we will copy onto blank microdrives any or all of the featured programs.

Each program will be a direct copy of the published listing, or an extended version of that listing where the program in question was too long to print in full (programs for which an abridged version has been published are marked with an asterisk).

It must be stressed that we are not selling the software itself, nor providing any guarantee that it performs any particular function (though we do check every program that is to appear in *QL User*), we are merely offering a service to readers who wish to obtain *QL User* programs on drive rather than by typing them in straight from the page.

HOW TO ORDER

Listed below are programs which have appeared as listings inside *QL User*.

To the right of each program entry is a small box, which you should mark with a bold cross if you want to order that program.

Once you have put a cross next to all the programs you wish to have copied onto microdrive, simply complete the rest of the order form and send it along with your PO/cheque AND BLANK FORMATTED DRIVE to:

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ORDER FORM

Author	Language	Program Name	Price	Issue	Size	
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Richard Cross	(AO)	Mini Monitor	£3.00	Oct	60	☐
Pocket sized monitor with comprehensive facilities						
A Didcock	(B)	Connect4	£1.00	Sept	15	☐
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Shergold & Tose	(B)	* Golf	£2.00	May	35	☐
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Steve Deary	(B)	Pacman	£1.00	Mar	20	☐
A reasonably fast rendition of the famous arcade favourite						
Andy Carmicheal	(B)	Family Tree	£3.00	Aug	100	☐
Archive program and database for setting up and displaying large family trees						
James Lucy	(B)	Composer	£3.00	Oct	50	☐
Compose and play sheet music on the QL						
Mathew Capp	(B)	Miners	£2.00	Aug	30	☐
A nail biting management simulation that puts you in charge of the NCB						
PJ Smith	(B)	* DIY Adventure	£1.00	Feb	60	☐
A skeleton framework where you simply have to slot in the details to create your bespoke adventure						
R Green	(B)	Qthello	£1.00	Aug	25	☐
A 3D version of the well known board game Othello for one or two players						
S J Ackers	(B)	*Touch Type	£4.00	Aug	80	☐
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B = SuperBasic, AO = Assembler + Object Code (ready to run), MB = Machine Code + Basic loader

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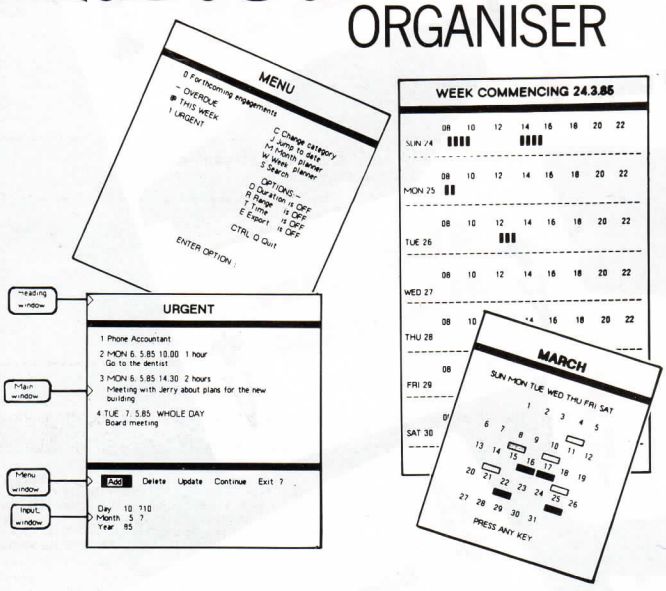

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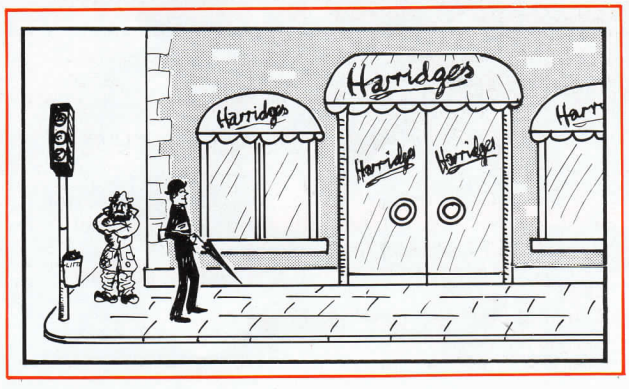

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